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ABSTRACT

A number of reasons are advanced to include a solar heating and cooling experiment in a library building. The unique aspects of the experiment are to be a seasonally adjustable collector tilt and testing of a new generation of absorption air conditioners. After a brief description of the proposed experiment, the proposal contains forms filed by the architects and engineers, and letters from U.S. senators, congressmen from Georgia, and others in favor of the project. The appendixes contain illustrations of the site location, architectural plans, and descriptions of computer programs to be used in the experiment. (MLF)

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RESEARCH PROPOSAL FOR THE DESIGN AND ENGINEERING PHASE OF SOLAR HEATING AND COOLING SYSTEM EXPERIMENT AT THE WARNER ROBINS PUBLIC LIBRARY WARNER ROBINS, GEORGIA

BY

THE HOUSTON COUNTY PUBLIC LIBRARY SYSTEM

EA 008 925

RESEARCH PROPOSAL FOR THE DESIGN AND ENGINEERING PHASE OF A SOLAR HEATING AND COOLING SYSTEM EXPERIMENT AT THE WARNER ROBINS PUBLIC LIBRARY WARNER ROBINS, GEORGIA

AUGUST 5, 1975

SUBMITTED TO THE

UNITED STATES ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

BY

WARREN H. PHILLIPS, A.M.L.S., DIRECTOR, HOUSTON COUNTY LIBRARY SYSTEM
LEE P. OLIVER, JR., ARCHITECT, AMERICAN INSTITUTE OF ARCHITECTS
WILLIAM C. SHERBIN, ENGINEER

FOR

HOUSTON COUNTY PUBLIC LIBRARY SYSTEM
1201 WASHINGTON AVENUE
PERRY, GEORGIA 31069

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1.0 INTRODUCTION AND SUMMARY

1.1 BACKGROUND

The Houston County Public Library System, with headquarters in Perry and branch libraries in Centerville and Warner Robins, is planning a new expanded replacement facility to be built in Warner Robins, Georgia. The new building is being funded by the City of Warner Robins, the Houston County Commission, and a matching grant from the State of Georgia. All funds for the conventional project have been approved and obligated.

1.2 THE WARNER ROBINS PUBLIC LIBRARY

All preliminary approvals, including submission of supportive documents and architectural schemes, have been released by state regulatory agencies for further production. The design development phase of drawings and specifications has been completed and construction document production is presently underway.

Anticipated date to begin construction is 1 October, 1975, with the projected construction time, depending on climatic and material supply conditions, estimated at 200 to 360 calendar days.

The contemporary one-story masonry building of 12,000 square feet will have a projected capacity of 55,400 volumes with appropriate ancillary facilities. Concrete slab, on grade, with perimeter insulation, will comprise the floor system; concrete masonry units, styrofoam wall insulation and exterior face brick will be the major exterior wall composition. The entire flat roof system will be supported on masonry bearing walls. The roof system will be steel bar joists, metal deck, urethane insulation with built-up roofing; a mineral acoustical tile ceiling system

with six inch fiberglass lay-in insulation will be suspended from the bar joists providing a finished ceiling. A minimum amount of fenestration will pierce the exterior walls for esthetic as well as practical purposes, all of which will be glazed with thermal insulated glass. The heating, air conditioning, and ventilating design has not been firmly established and can be readily modified to accommodate a solar energy system as may be deemed appropriate.

The proposed 200 by 906 foot site, donated by the City of Warner Robins, is located on the south side of Watson Boulevard, the major four-lane artery of the city which also connects Warner Robins Air Force Base and Interstate 75. This highly visible site is immediately across Watson Boulevard from the Warner Robins City Complex. The 82 by 142 foot library building's major axis is north and south; its rectangular shape and orientation will allow for a maximum number of solar collectors arranged in banks facing south. The more than ample site adequately provides for future expansion as well as underground thermal storage tanks.

1.3 THE SOLAR HEATING AND COOLING EXPERIMENT

The unique aspects of this experiment will be:

* Seasonally adjustable collector tilt.
* Testing of new generation of absorption air conditioners.

1.3.1 Seasonally Adjustable Collector Tilt

A fixed tilt is a compromise between winter and summer requirements. An optimum system would track the sun in both azimuth and elevation. However, for flat-plate collectors this would be very complex and expensive. It is possible to adjust the tilt of the collectors for summer and winter operation. At

this site, the optimum winter tilt would be 57° and the optimum summer tilt 9°. It is proposed to adjust the tilt of the collectors twice a year to the above values thereby maximizing the energy collected.

1.3.2 New Generation of Absorption Air Conditioners

The current inventory of absorption air conditioners are not suited for efficient operation in the regime of flat-plate collectors. Some units must be derated as much as 70 percent of capacity to provide cooling with firing water temperatures in the 200°F range. Any increase in temperature will severaly hamper the output of the flat-plate collector.

In late 1976, ARKLA plans to market a 25-ton absorption chiller capable of full rated capacity of 195°F inlet temperatures. Westinghouse has been in communication with ARKLA on this matter and would receive the first available unit.

1.3.3 The Solar System

The proposed solar system would consist of approximately 2500 square feet of collectors capable of a seasonal tilt adjustment to take advantage of the change in solar declination. In the winter, the collectors would be manually set at a 57° tilt from September to March. Whereas the summer tilt would be 9° from March through September as depicted in figure 1. With these two adjustments, the collector would be following the most favorable tilts (solid line)

for incident radiation, except for about four weeks in early spring and fall. However, it appears that the building load would be low during these relatively mild periods and use of only two tilts can be justified.

During the heating season, the system output would be about 1.5 million Btu per day. With a good selective surface, the chiller output would peak in June at about 1.2 million Btu per day (100 tons/day). Thus, it seems feasible to accomplish the cooling with the new 25 ton/hr ARKLA machine tailored to flat plate solar collector output temperatures of 180° to 195°F firing water.

Underground storage tanks would accomplish heating and cooling on overcast days and would contain about 15,000 gallons of water. In order to optimize thermal performance, at least two tanks would be used to store both hot and cold water.

A detailed hourly computer analysis of components, solar system, and building load would be conducted along lines similar to NBS recommendations and standards. The evaluation would account for each of the various operational modes possible in the given system. These might include, for example:

* Collector-storage system for heating.
* Collector-storage system driving absorption refrigeration unit for cooling with cold storage.
* Operation of auxiliary heater for above modes with collectors operating to storage system only.
* Operation of economizer cycle for cooling with fresh air.
* Utilization of exterior shading to reduce cooling load.
* Optimization of collector azimuth angle for peak daily operation.

An explanation of computer programs that would be used is contained in Appendix B.

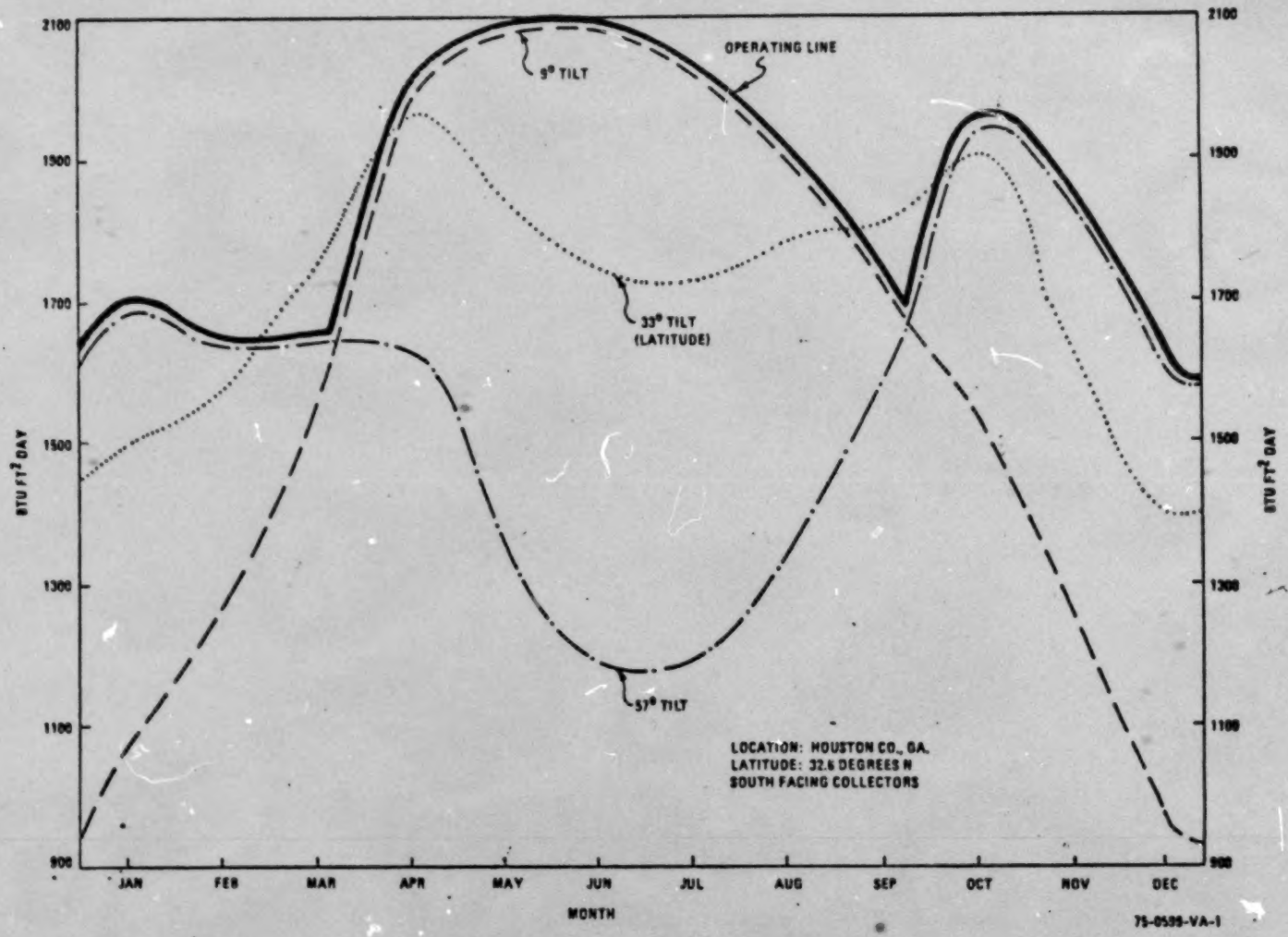


Figure 1. Incident Solar Radiation versus Month for Three Collector Tilt Angles

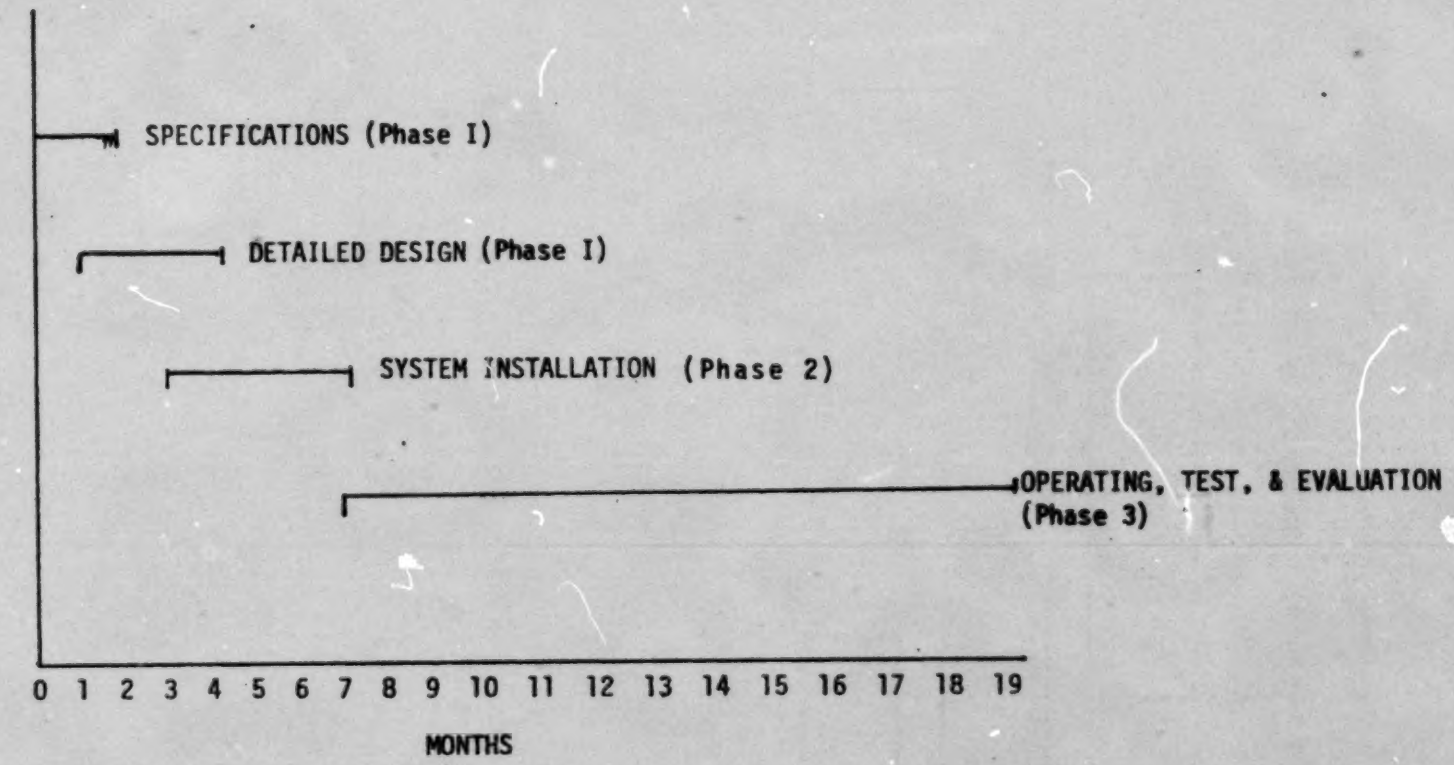

SPECIFICATIONS (Phase I)
DETAILED DESIGN (Phase I)
SYSTEM INSTALLATION (Phase 2)
OPERATING, TEST, & EVALUATION
(Phase 3)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
MONTHS

Figure 2 Solar Supplement Work Schedule

1.5 GOVERNMENT FUNDING REQUIRED FOR CONVENTIONAL CONSTRUCTION

$ 175,000.00	The City of Warner Robins
75,000.00	The Houston County Commission
250,000.00	The State of Georgia
$ 500,000.00	Total Project Cost

2.0 TECHNICAL DISCUSSION

2.1 SOLAR SUPPLEMENT TECHNICAL DESCRIPTION

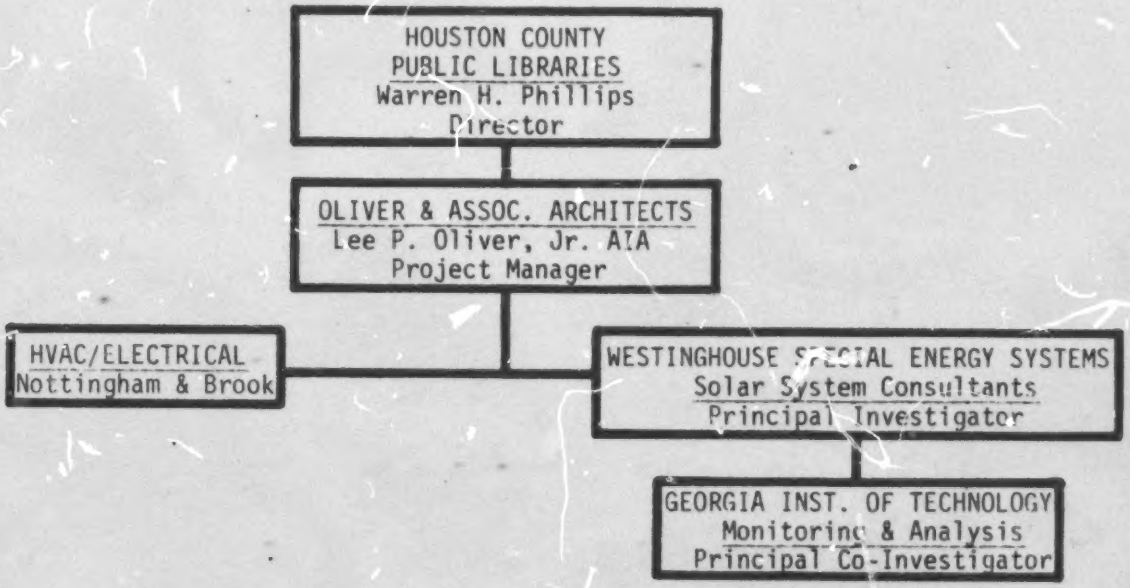
The solar system design would specify the use of off-the-shelf components in all phases of the operation. Inhibited water would be used as the circulating fluid throughout the system to unit convectors in the heating season. The cooling would be accomplished by circulating cold water from the chiller in the same piping network. A drain-down capability with nitrogen purging will be necessary to prevent freezing.

A manually operated tilting structure will be provided for each row of collectors. Mechanical stops will be designed into the array to prevent loads on the lifting mechanism. There will be no movable fluid seals, only flexible hoses on the water manifolds.

The collector inlet temperatures will be 105^{o}F in the winter and 165^{o}F in the summer, with flow control provided by a variable speed pump. The corresponding collector daily efficiencies are about 35 per cent and 20 per cent respectively for two glass covers and an average selective surface. The use of selective black chrome and low iron glass will be investigated. It has been shown that the thermal performance can be improved as much as 35 per cent with these applications.

3.0 ORGANIZATION AND PERSONNEL

3.1 ORGANIZATION



3.2 RESUMES

Lee Percy Oliver, Jr.,Architect

Date of Birth: 1925, Alexander City, Alabama

Education:

Mercer University, Macon Georgia
Auburn University, Auburn, Alabama, Bachelor of Architecture 1957

Registered Architect:

Georgia, License Number 1405
Alabama, License Number 1271
Florida, License Number 5628
North Carolina, License Number 2154
South Carolina, License Number 1373
Tennessee, License Number 8745
Virginia, License Number 03037

Experience:

1957-1965: Draftsman/Designer,
Bernard A. Webb, Jr., Architect
Macon, Georgia

1965-1969: Partner,
Dennis and Oliver Architects
Macon, Georgia

1969-1974: President,
Oliver and Richardson Architects, Ltd.
Macon, Georgia

1974-Present: President,
Oliver and Associates Architects, Ltd.
Macon, Georgia

Historic Preservation and Restoration:

Several completed as well as on-going restoration projects (residential) for private clients.

June, 1975: Matching grant as architectural consultant from The National Trust for Historic Preservation for planning restoration of the Sidney Lanier Cottage, Macon, Georgia.

Independent Research and Study of Architectural Character:

Areas: Southeast and Mid-Atlantic region, England, France, Germany, Denmark, Netherlands, Italy, Libya

Professional, Civic, and Service Activities:

Present:
Member, The American Institute of Architects
Member, The National Council of Architectural Registration Boards
Member, The American Society of Interior Designers
President, The Middle Georgia Chapter, American Institute of Architects
Member, Board of Directors, Georgia Association, American Institute of Architects
Trustee, Middle Georgia Historical Society
Member, Board of Directors, Macon Kiwanis Club
Member, Board of Directors, Macon In-Town Association
Member, Board of Directors, Macon Chapter, American Red Cross

Past:
Immediate Past President, Board of Directors, Museum of Arts and Sciences, Macon, Georgia
President, Macon Section, North Georgia Chapter, American Institute of Architects
Chairman, Macon-Bibb County Beautification Commission
Member, Board of Directors, Macon Little Theatre

Vice-President, Macon Area, Association of Georgia Artists
Secretary, Vestryman, Christ Episcopal Church, Macon, Georgia
Producer of theatrical presentation of Macon Chamber of Commerce's civis Sesquicentennial Celebration "Creek Week"
Member, Board of Directors, Middle Georgia Auburn University Alumni Association

STANDARD FORM 251, JUNE 1961
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.803

U. S. GOVERNMENT
ARCHITECT-ENGINEER QUESTIONNAIRE

See explanatory notes on page 9.

DATE (Month, day, and year)

1. FIRM NAME

Oliver and Associates Architects, Ltd.

2. ESTABLISHED
A. YEAR: 1974
B. STATE: Ga.

3. TYPE OF ORGANIZATION (Check one)
[ ] INDIVIDUAL [X] CORPORATION [ ] OTHER (Explain in item 22)
[ ] PARTNERSHIP [ ] JOINT VENTURE

4. FORMER FIRM NAME(S), IF ANY, AND YEAR(S) ESTABLISHED

Oliver and Richardson - Estab. 4/21/69
Dennis & Oliver Architects - Estab. 12/5/65

5. HOME OFFICE BUSINESS ADDRESS AND TELEPHONE NO.

1215 Georgia Power Building, Macon, Georgia 31201
Telephone No. (912) 742-7547

6. PRESENT BRANCH OFFICE(S)
A. ADDRESS: None
B. TELEPHONE NO.
C. NAME OF PERSON IN CHARGE

7. PRINCIPALS OF FIRM
NAMES: Lee P. Oliver, Jr.

8. ASSOCIATE MEMBERS OF FIRM
NAMES: William R. Cadle

9. KEY PERSONNEL OF FIRM (Names)

A. ARCHITECTS: Lee P. Oliver, Jr.; William R. Cadle
D. STRUCTURAL ENGINEERS
G. ELECTRICAL ENGINEERS (Indicate Specialty)
B. LANDSCAPE ARCHITECTS
E. SANITARY ENGINEERS (Indicate Specialty)
H. PLANNERS (Indicate Specialty as Site, City, Town, Community, etc.): Lee P. Oliver, Jr. (Site Planning)
C. CIVIL ENGINEERS
F. MECHANICAL ENGINEERS (Indicate Specialty)
I. OTHER KEY PERSONNEL (Indicate Specialty): Claudia C. Schlueter (Project Coordinator)

10. NUMBER OF PERSONNEL IN YOUR PRESENT ORGANIZATION

LOCATED AT	a. PRINCIPALS & KEY PERSONNEL*			b. OTHER PERSONNEL										TOTALS
	ARCH. (1)	ENG. (2)	OTHER (3)	ARCH. (4)	ENGINEERS (5) MECH.	(6) ELEC.	(7) CIVIL	(8) OTHER	DRAFTSMEN (9)	SPEC. WRITERS (10)	ESTIMATORS (11)	INSPECTORS (12)	SURVEYORS (13)	BALANCE (14)	(15)
A. HOME OFFICE	2		1						2						5
B. BRANCH OFFICE IN															
C. TOTALS	2		1						2						5

11. NUMBER OF PERSONNEL IN YOUR ORGANIZATION DURING LAST 5 YEARS

A. MAXIMUM NO.: 5
B. YEAR: 1974
C. NORMAL STRENGTH: 5

251-102

*(Total of items 7 and 9)

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12. OUTSIDE ASSOCIATES AND CONSULTANTS USUALLY EMPLOYED BY YOUR FIRM
(Furnish a separate completed questionnaire for each firm or individual listed below but see note c, page 9)

a. CATEGORY	b. NAME OF FIRM OR INDIVIDUAL AND ADDRESS	a. CATEGORY	b. NAME OF FIRM OR INDIVIDUAL AND ADDRESS
A. ARCHITECTS	Finch, Alexander, Barnes, Rothschils & Paschal 44 Broad Street, N. W. Atlanta, Georgia	F. MECHANICAL ENGINEERS	Nottingham & Brook 420 College Street Macon, Georgia
B. LANDSCAPE ARCHITECTS	Mrs. Richard George, A.S.L.A. 2484 Ingleside Avenue Macon, Georgia	G. ELECTRICAL ENGINEERS	John D. Harrison 165 First Street Macon, Georgia
C. CIVIL ENGINEERS	Tamplin & Sherrill 3038 Broadway Macon, Georgia	H. PLANNERS	
D. STRUCTURAL ENGINEERS	Wm. Exley Smith Co. 3464 Vineville Ave. Macon, Georgia Polychrone & Assoc. Engs. 56 - 13th St., N. E. Atlanta, Georgia	I. ESTIMATORS	Construction Consultants Company 4315 N. E. Expressway Road Atlanta, Georgia
E. SANITARY ENGINEERS	S. J. Gostin Company, Inc. 3243 Vineville Avenue Macon, Georgia	J. OTHER CONSULTANT AFFILIATIONS	

13. INDICATE IN ORDER OF PRECEDENCE, USING "1," "2," "3," ETC., THE TYPES OF PROJECTS IN WHICH YOUR FIRM SPECIALIZES *(Work specialties not sufficiently identified by the printed general categories are to be listed separately in the spaces provided)*

___	ACOUSTICS • SOUND SUPPRESSION	___	HOSPITALS	1	PUBLIC BUILDINGS
1	AIRFIELD FACILITIES	1	HOUSING	___	SURVEYS AND REPORTS
___	AIR COND. • REFRIG. • VENT.	1	INDUSTRIAL BUILDINGS	___	UTILITIES
___	BRIDGES	___	IRRIGATION OR DRAINAGE	___	WATER • SEWAGE
___	CHANNEL IMPROVEMENTS	2	LABORATORIES	1	Educational Facilities
___	CHEMICAL FACILITIES	___	MANUALS	1	Recreational
___	COMMUNICATIONS	1	MASTER PLANNING • SITE DEVELOP.		
1	COMMERCIAL BUILDINGS	___	MILITARY STANDARD DESIGN		
___	EARTH FILL DAM WORK	___	MISSILES • FACILITIES • FUELS		
___	ELECTRONIC FACILITIES	___	NUCLEAR FACILITIES		
___	HARBOR FACILITIES	___	PETROLEUM FACILITIES		
___	HIGHWAYS	2	POWER • HEATING PLANTS		

14. INDICATE THE SCOPE OF SERVICES PROVIDED BY YOUR FIRM WITHOUT USE OF OUTSIDE ASSOCIATES OR CONSULTANTS ON TYPES OF PROJECTS INDICATED IN ITEM 13 *(i.e. Architectural, Mechanical, Electrical, Structural, etc.)*

Architectural, Program Development, Master Planning, Landscaping, Interiors, Exhibition Display, Lighting Design.

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15. PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES WITHIN YOUR FIRM
(Furnish complete data but keep to essentials)

A. NAME *(Last-first-middle initial)*: Oliver, Lee P., Jr.

DATE OF BIRTH (Month-day-year)	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL
Oct. 7, 1925		Since Estab. 1974	8½	8½

EDUCATION *(College, degree, year, specialization)*: Auburn University - Bachelor of Architecture, 1957

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS: American Institute of Architects; National Council of Architectural Registration Boards; American Society of Interior Designers

REGISTRATION *(Type, year, State)*: Architect: 1965 Ga.; 1972 Ala.; 1972 Fla.; 1972 S. Carolina; 1972 N. Carolina; 1972 Tennessee; 1972 Virginia

B. NAME *(Last-first-middle initial)*: Cadle, William R.

DATE OF BIRTH (Month-day-year)	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL
June 2, 1936				10

EDUCATION *(College, degree, year, specialization)*: Georgia Tech - B. S. 1961

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS: American Institute of Architects

REGISTRATION *(Type, year, State)*: Architect - 1974, Georgia

C. NAME *(Last-first-middle initial)*:

DATE OF BIRTH (Month-day-year)	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL

EDUCATION *(College, degree, year, specialization)*:

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS:

REGISTRATION *(Type, year, State)*:

D. NAME *(Last-first-middle initial)*:

DATE OF BIRTH (Month-day-year)	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL

EDUCATION *(College, degree, year, specialization)*:

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS:

REGISTRATION *(Type, year, State)*:

E. NAME *(Last-first-middle initial)*:

DATE OF BIRTH (Month-day-year)	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL

EDUCATION *(College, degree, year, specialization)*:

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS:

REGISTRATION *(Type, year, State)*:

F. NAME *(Last-first-middle initial)*:

DATE OF BIRTH (Month-day-year)	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL

EDUCATION *(College, degree, year, specialization)*:

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS:

REGISTRATION *(Type, year, State)*:

STANDARD FORM 251
JUNE 1961

15. CONTINUED — PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES WITHIN YOUR FIRM
(Furnish complete data but keep to essentials)

G. NAME *(Last-first-middle initial)*

DATE OF BIRTH *(Month-day-year)*	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL

EDUCATION *(College, degree, year, specialization)*

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

REGISTRATION *(Type, year, State)*

H. NAME *(Last-first-middle initial)*

DATE OF BIRTH *(Month-day-year)*	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL

EDUCATION *(College, degree, year, specialization)*

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

REGISTRATION *(Type, year, State)*

I. NAME *(Last-first-middle initial)*

DATE OF BIRTH *(Month-day-year)*	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL

EDUCATION *(College, degree, year, specialization)*

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

REGISTRATION *(Type, year, State)*

J. NAME *(Last-first-middle initial)*

DATE OF BIRTH *(Month-day-year)*	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL

EDUCATION *(College, degree, year, specialization)*

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

REGISTRATION *(Type, year, State)*

K. NAME *(Last-first-middle initial)*

DATE OF BIRTH *(Month-day-year)*	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL

EDUCATION *(College, degree, year, specialization)*

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

REGISTRATION *(Type, year, State)*

L. NAME *(Last-first-middle initial)*

DATE OF BIRTH *(Month-day-year)*	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL

EDUCATION *(College, degree, year, specialization)*

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

REGISTRATION *(Type, year, State)*

16. PRESENT ACTIVITIES ON WHICH YOUR FIRM IS DESIGNATED ARCHITECT OR ENGINEER OF RECORD

NAME AND TYPE OF PROJECT	LOCATION	NAME AND ADDRESS OF OWNER	ESTIMATED CONSTRUCTION COST	PERCENT COMPLETED	
				DESIGN	FIELD SUPV.
Apartment Complex	Laurens, S. C.	Fickling & Walker Development Co., Box 3245, Macon, Ga.	790,000	100	0
Condominium Complex	Augusta, Ga.	Fickling & Walker Development Co., Box 3245, Macon, Ga.	780,000	100	0
Warner Robins Library	Warner Robins, Ga.	Houston County Library Board P. O. Drawer A, Perry, Ga.	500,000	85	0
Steak House	Columbia, S. C.	S & S Food Service P. O. Box 4688, Macon, Ga.	194,000	70	0
Steak House	Rockingham, N. C.	S & S Food Service P. O. Box 4688, Macon, Ga.	175,000	15	0
Apartment Complex	Asheville, N. C.	Fickling & Walker Development Co., Box 3245, Macon, Ga.	1,200,000	100	0
Restoration of Historic Bldg.	Sumter County, Ga.	Mrs. Robert Hodges Andersonville, Ga.	No Budget	100	70
Admissions Office Facilities	Macon, Ga.	Mercer University, Macon, Ga.	75,000	5	0
Banking Facilities	Macon, Ga.	1st National Bank & Trust Co. P. O. Box 4248, Macon, Ga.	225,000	1	0
Renovation of Banking Facilities	Macon, Ga.	1st National Bank & Trust Co. P. O. Box 4248, Macon, Ga.	80,000	50	0
Renovation of Food Service Facilities, Nursing Home	Bradenton, Fla.	S & S Food Administrators P. O. Box 4688, Macon, Ga.	110,000	5	0
Renovations to 10 Bibb County Schools	Macon, Ga.	Bibb County Bd. of Education P. O. Box 6157, Macon, Ga.	266,575	100	99
Restoration of Sidney Lanier Cottage	Macon, Ga.	Middle Georgia Historical Society, 935 High St., Macon, Ga.	55,000	100	85
TOTAL NUMBER OF PRESENT PROJECTS:		TOTAL ESTIMATED CONSTRUCTION COST:			

15

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17. PRESENT ACTIVITIES ON WHICH YOUR FIRM IS ASSOCIATED WITH OTHERS
(Indicate phase of work for which your firm is responsible)

NAME OF PROJECT AND PHASE OF WORK	LOCATION	OWNER	ESTIMATED CONSTRUCTION COST OF		PERCENT OF ENTIRE PROJECT COMPLETED		FIRM ASSOCIATED WITH
			ENTIRE PROJECT	WORK FOR WHICH YOUR FIRM IS RESPONSIBLE	DESIGN	FIELD SUPV.	

TOTAL NUMBER OF PRESENT PROJECTS:

TOTAL ESTIMATED CONSTRUCTION COST OF WORK FOR WHICH YOUR FIRM IS RESPONSIBLE:

STANDARD FORM 254

18. COMPLETED WORK ON WHICH YOUR FIRM WAS DESIGNATED ARCHITECT OR ENGINEER OF RECORD DURING THE LAST 10 YEARS

NAME AND TYPE OF PROJECT	LOCATION	YEAR YOUR WORK COMPLETED	NAME AND ADDRESS OF OWNER	ESTIMATED CONSTRUCTION COST	CONSTRUCTED (Yes or No)
Shane's Restaurant	Albany, Ga.	1974	S & S Food Service P.O. Box 4688, Macon, Ga.	150,000	Yes
Locker Room Building	Macon, Ga.	1974	Southern Wood Piedmont Co. 3210 Roff Ave., Macon, Ga.	21,000	Yes
Apartment Complex	Dalton, Ga.	1973	Fickling & Walker Development Co., Box 3245, Macon, Ga.	1,440,000	Yes
International Inn	Macon, Ga.	1973	Colonial Enterprises, 116 Hawthorne Rd., Warner Robins, Ga.	300,000	Yes
Infirmary	Macon, Ga.	1973	Georgia Academy for the Blind 2895 Vineville Ave., Macon,Ga.	96,500	Yes
City-County Library	Perry, Ga.	1973	City of Perry, Georgia P.O. Drawer A, Perry, Ga.	135,400	Yes
Apartment Complex	Statesboro, Ga.	1973	Fickling & Walker Development Co., Box 3245, Macon, Ga.	720,000	Yes
6 Projects, Maintenance & Repair	Robins Air Force Base, Ga.	1973	U.S. Government Robins Air Force Base, Ga.	137,000	Yes
Shurlington Branch Library	Macon, Ga.	1972	Middle Ga. Regional Library 911 First St., Macon, Ga.	172,500	Yes
Residence	Macon, Ga.	1972	Mr. & Mrs. Charles English 641 Lee Rd., Macon, Ga.	75,000	Yes
Walnut St. Professional Bldg.	Macon, Ga.	1972	Springwall Corporation 152 Spring St., Macon, Ga.	150,000	Yes
Dormitories	Macon, Ga.	1972	Georgia Academy for the Blind 2895 Vineville Ave., Macon,Ga.	471,200	Yes
2 Dormitories, Kitchen-Dining Facilities, Central Power Plant	Macon, Ga.	1972	Georgia Academy for the Blind 2895 Vineville Ave., Macon,Ga.	725,500	Yes
Additions and Alterations to Ivan Allen Company	Macon, Ga.	1971	Ivan Allen Company 152 Spring St., Macon, Ga.	50,000	Yes
Campus Master Plan	Macon, Ga.	1971	Georgia Academy for the Blind 2895 Vineville Ave	N/A	
Darwood Mobile Home Park	Macon, Ga.	1971	E.D. McAfee 1127 Oakcliff Rd., Macon, Ga.	355,000	No
Residence	Macon, Ga.	1970	Dr. & Mrs. W. H. Somers 2881 Ingleside Ave., Macon,Ga.	270,000	Yes
Open Plan Elementary School	Macon, Ga.	1970	Bibb County Board of Education P.O. Box 6157, Macon, Ga.	701,314	Yes
Recreational & Service Facilities	Lake Tobesofkee Bibb County, Ga.	1969	Bibb County Commission Macon, Ga.	382,000	Yes
TOTAL NUMBER OF COMPLETED PROJECTS:	19		TOTAL ESTIMATED CONSTRUCTION COST:	$6,352,414	

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(CONTINUED TO PAGE 7A)

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19. COMPLETED WORK ON WHICH YOUR FIRM WAS ASSOCIATED WITH OTHER FIRMS DURING THE LAST 10 YEARS
(Indicate phase of work for which your firm was responsible)

NAME OF PROJECT AND PHASE OF WORK	LOCATION	OWNER	YEAR YOUR WORK COMPLETED	ESTIMATED CONSTRUCTION COST OF ENTIRE PROJECT	ESTIMATED CONSTRUCTION COST OF WORK FOR WHICH YOUR FIRM WAS RESPONSIBLE	CONSTRUCTED (Yes or No)	FIRM ASSOCIATED WITH
A Water Treatment Plant for Middle Georgia College	Cochran, Ga.	Georgia State Board of Regents	1971	$ 70,000	30,000	Yes	Tribble & Richardson Consulting Engineers 2484 Ingleside Ave. Macon, Ga.
A Water Treatment Plant for Perry, Ga.	Perry, Ga.	City of Perry, Ga. P. O. Drawer A Perry, Ga.	1973	500,000	200,000	Yes	Tribble & Richardson Consulting Engineers 2484 Ingleside Ave. Macon, Ga.
Federal Office Bldg. and Postal Facility	Griffin, Ga.	Federal Government	1969	3,000,000	3,000,000	No	Joint Venture with Gerald Bilbro, Griffin, Ga.

TOTAL NUMBER OF COMPLETED PROJECTS: 3

TOTAL ESTIMATED CONSTRUCTION COST OF WORK FOR WHICH YOUR FIRM WAS RESPONSIBLE: $3,230,000

18. COMPLETED WORK ON WHICH YOUR FIRM WAS DESIGNATED ARCHITECT OR ENGINEER OF RECORD DURING THE LAST 10 YEARS (CONTINUED)

NAME AND TYPE OF PROJECT	LOCATION	YEAR YOUR WORK COMPLETED	NAME AND ADDRESS OF OWNER	ESTIMATED CONSTRUCTION COST	CONSTRUCTED (Yes or No)
2 Projects, Maint. & Repair	Robins Air Force Base, Ga.	1974	U.S. Government, Dept. of The Air Force, Robins AFB, Ga.	97,000	Yes
Apartment Complex	Thomasville, Georgia	1974	George M. Nichols P.O. Box 2255, Valdosta, Ga.	1,056,000	Yes
Vocational-Educational Bldg.	Macon, Ga.	1975	Bibb County Board of Education P.O. Box 6157, Macon, Ga.	227,280	No
Renovation to Food Service Facilities (Bowling Center)	Robins Air Force Base, Ga.	1974	U.S. Government, Dept. of The Air Force, Robins AFB, Ga.	50,000	Yes
Shane's Restaurant	Cayce, S. C.	1974	S & S Food Service P.O. Box 4688, Macon, Ga.	173,000	Yes
Residence	Macon, Ga.	1974	John C. Cork 7325 Wesley's Walk, Macon, Ga.	75,000	Yes
Alterations & Additions to Residence	Macon, Ga.	1974	Mr. Charles H. Yates 230 Idle Hour Dr., Macon, Ga.	60,000	Yes

TOTAL NUMBER OF COMPLETED PROJECTS: 26 (including projects from Page 7)

TOTAL ESTIMATED CONSTRUCTION COST: $ 8,090,694 (including construction cost from Page 7)

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20. EXHIBITS OF COMPLETED WORK	*Unless specifically requested, submission of photographs is optional. Where submitted, furnish one exterior and one interior photograph of five examples of completed architectural work that are listed in items 18 and 19. (Photographs of models, renderings, sketches, etc., are NOT desired.) Size of photographs not to exceed 8½"x11". On the back of each photograph give the following information: (1) Name of your firm; (2) Name and address of client; (3) Type of structure; (4) Location of structure; (5) Cost of specific structure. Photographs of electrical or mechanical facilities and other components of a decided engineering character are not necessary.*				
21. SECURITY CLEARANCE *(See Note d)*	A. CURRENT STATUS *(Check one)* ☐ ACTIVE ☐ INACTIVE ☐ NONE	B. DEGREE OF CLEARANCE	C. DATE OF CLEARANCE	D. CLEARED BY	E. HAVE PRINCIPALS BEEN CLEARED? ☐ YES ☐ NO

22. IN THE EVENT SPACES PROVIDED ON THE FORM ARE NOT SUFFICIENT FOR ENTRIES, OR IF YOU WISH TO FURNISH ADDITIONAL INFORMATION, IT MAY BE INSERTED HERE, ON THE REVERSE OF THIS PAGE, OR ON SEPARATE SHEETS, WITH APPROPRIATE REFERENCES.

23. PURPOSE OF SUBMITTING THIS QUESTIONNAIRE *(Check A or B, not both)*

☒ A. I/We wish to be considered for architectural or engineering services in connection with the ☒ design, ☒ inspection, ☒ supervision *(check applicable box or boxes)* of construction projects for Federal Agencies.

☐ B. This completed questionnaire is submitted as evidence of employment as outside associate or consultant. *(See item 12.)*

NAME OF FIRM ASSOCIATED WITH

As of this date: May 14, 1975 the foregoing is a true statement of facts.

NAME OF FIRM OR INDIVIDUAL SUBMITTING QUESTIONNAIRE	TYPE NAME AND TITLE OF PERSON SIGNING	SIGNATURE
Oliver and Associates Architects, Ltd.	Lee P. Oliver, Jr., President	Lee P. Oliver Jr.

NOTES:
(a) Form is to be completed by typewriter. Completed forms may be reproduced in any quantity deemed necessary to meet distribution requirements.
(b) It will be to a firm's advantage to maintain its experience record on a current basis. This may be accomplished by periodically forwarding current data.
(c) It is NOT necessary for individuals or firms who check item 23B to furnish separate questionnaires for their outside associates and consultants.
(d) Item 21 is for consideration only with respect to classified projects.

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* GPO : 1958 O—493-812

STANDARD FORM 251, JUNE 1961
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.803

U. S. GOVERNMENT
ARCHITECT-ENGINEER QUESTIONNAIRE

See explanatory notes on page 9.

DATE (Month, day, and year): January 1, 1975

1. FIRM NAME: NOTTINGHAM & BROOK

2. ESTABLISHED — A. YEAR: 1973 — B. STATE: Ga.

3. TYPE OF ORGANIZATION (Check one): [ ] INDIVIDUAL [X] PARTNERSHIP [ ] CORPORATION [ ] JOINT VENTURE [ ] OTHER (Explain in item 22)

4. FORMER FIRM NAME(S), IF ANY, AND YEAR(S) ESTABLISHED
George M. Nottingham, Jr. -- 1960
Nottingham, Brook & Floyd -- 1967
Nottingham, Brook, Floyd & Harrison -- 1971

5. HOME OFFICE BUSINESS ADDRESS AND TELEPHONE NO.
420 College Street
Macon, Georgia 31201 912 - 745-1691

6. PRESENT BRANCH OFFICE(S) — A. ADDRESS: NONE — B. TELEPHONE NO. — C. NAME OF PERSON IN CHARGE

7. PRINCIPALS OF FIRM — NAMES:
George M. Nottingham, Jr.
Arthur D. Brook

8. ASSOCIATE MEMBERS OF FIRM — NAMES: NONE

9. KEY PERSONNEL OF FIRM (Names)

A. ARCHITECTS

B. LANDSCAPE ARCHITECTS

C. CIVIL ENGINEERS

D. STRUCTURAL ENGINEERS

E. SANITARY ENGINEERS (Indicate Specialty)

F. MECHANICAL ENGINEERS (Indicate Specialty)
George M. Nottingham, Jr., P.E.
(Plumb., HVAC, Electrical)
Arthur D. Brook, P.E.
(HVAC & Fire Protection)

G. ELECTRICAL ENGINEERS (Indicate Specialty)
Charles E. Pennington, P.E.
(Lighting, Power, Protection, Communication)

H. PLANNERS (Indicate Specialty as Site, City, Town, Community, etc.)

I. OTHER KEY PERSONNEL (Indicate Specialty)
Wilfred A. Nottingham, E.I.T.
(HVAC, Electrical, Computer)
Richard Taylor
(Plumbing)

10. NUMBER OF PERSONNEL IN YOUR PRESENT ORGANIZATION

LOCATED AT	a. PRINCIPALS & KEY PERSONNEL* ARCH. (1)	ENG. (2)	OTHER (3)	b. OTHER PERSONNEL ARCH. (4)	ENGINEERS (5)MECH.	(6)ELEC.	(7)CIVIL	(8)OTHER	DRAFTSMEN (9)	SPEC. WRITERS (10)	ESTIMATORS (11)	INSPECTORS (12)	SURVEYORS (13)	BALANCE (14)	TOTALS (15)
A. HOME OFFICE		4	1						3					3	11
B. BRANCH OFFICE IN															
C. TOTALS		4	1						3					3	11

11. NUMBER OF PERSONNEL IN YOUR ORGANIZATION DURING LAST 5 YEARS — A. MAXIMUM NO.: 14 — B. YEAR: 1973 — C. NORMAL STRENGTH: 12

231-102

*(Total of items 7 and 9)

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12. OUTSIDE ASSOCIATES AND CONSULTANTS USUALLY EMPLOYED BY YOUR FIRM
(Furnish a separate completed questionnaire for each firm or individual listed below but see note c, page 9)

a. CATEGORY	b. NAME OF FIRM OR INDIVIDUAL AND ADDRESS	a. CATEGORY	b. NAME OF FIRM OR INDIVIDUAL AND ADDRESS
A. ARCHITECTS	Oliver & Associates - Macon Dunwody & Co. - Macon Ellis, Ingram, Parris & Gregory - Valdosta Matthews, Holliday, Couch & Hollis - Macon	F. MECHANICAL ENGINEERS	
B. LANDSCAPE ARCHITECTS	William Y. McLean - Tifton	G. ELECTRICAL ENGINEERS	
C. CIVIL ENGINEERS	Tribble & Richardson - Macon	H. PLANNERS	
D. STRUCTURAL ENGINEERS	Wm. Exley Smith - Macon Lindsey & Ritter - Albany Kun-Young Chiu - Valdosta	I. ESTIMATORS	
E. SANITARY ENGINEERS		J. OTHER CONSULTANT AFFILIATIONS	

13. INDICATE IN ORDER OF PRECEDENCE, USING "1," "2," "3," ETC., THE TYPES OF PROJECTS IN WHICH YOUR FIRM SPECIALIZES *(Work specialties not sufficiently identified by the printed general categories are to be listed separately in the spaces provided)*

___	ACOUSTICS · SOUND SUPPRESSION	9	HOSPITALS	10	PUBLIC BUILDINGS
___	AIRFIELD FACILITIES	11	HOUSING	12	SURVEYS AND REPORTS
1	AIR COND. · REFRIG. · VENT.	7	INDUSTRIAL BUILDINGS	4	UTILITIES
___	BRIDGES	___	IRRIGATION OR DRAINAGE	6	WATER · SEWAGE
___	CHANNEL IMPROVEMENTS	___	LABORATORIES	2	Lighting
___	CHEMICAL FACILITIES	___	MANUALS		
___	COMMUNICATIONS	___	MASTER PLANNING · SITE DEVELOP.	3	Electrical Distribution
8	COMMERCIAL BUILDINGS	___	MILITARY STANDARD DESIGN		
___	EARTH FILL DAM WORK	___	MISSILES · FACILITIES · FUELS		
___	ELECTRONIC FACILITIES	___	NUCLEAR FACILITIES		
___	HARBOR FACILITIES	___	PETROLEUM FACILITIES		
___	HIGHWAYS	5	POWER · HEATING PLANTS		

14. INDICATE THE SCOPE OF SERVICES PROVIDED BY YOUR FIRM WITHOUT USE OF OUTSIDE ASSOCIATES OR CONSULTANTS ON TYPES OF PROJECTS INDICATED IN ITEM 13 *(i.e. Architectural, Mechanical, Electrical, Structural, etc.)*

MECHANICAL and ELECTRICAL services on all.

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15. PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES WITHIN YOUR FIRM
(Furnish complete data but keep to essentials)

A. NAME *(Last-first-middle initial)*
Nottingham, George M. Jr.

DATE OF BIRTH (Month-day-year)	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL
February 1, 1925		2	14	12

EDUCATION *(College, degree, year, specialization)*
Georgia Institute of Technology, B.S., 1947
Electrical Engineering

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS
C.E.C., ASHRAE, IES, GSPE, NSPE, CSI, NFPA.

REGISTRATION *(Type, year, State)*
H.V.A.C. - 1954 - Georgia

B. NAME *(Last-first-middle initial)*
Brook, Arthur D.

DATE OF BIRTH (Month-day-year)	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL
May 3, 1932		2	6 1/2	9

EDUCATION *(College, degree, year, specialization)*
Georgia Institute of Technology, B.S., 1956
Power and Air Conditioning
Georgia State College, MBA, 1961, Management.

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS
GSPE, NSPE, PEPP, CEC, ASME, NFPA

REGISTRATION *(Type, year, State)*
Mechanical: 1961, GA.; 1973, FLA.; 1973, ALA.; 1973, VA.

C. NAME *(Last-first-middle initial)*
Pennington, Charles E.

DATE OF BIRTH (Month-day-year)	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL
1943		--	--	8

EDUCATION *(College, degree, year, specialization)*
Georgia Institute of Technology, B.S., 1966
Electrical Engineering

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS
GSPE, NSPE

REGISTRATION *(Type, year, State)*
Electrical: 1971, GA.; 1974, FLA.; 1974, VA.

D. NAME *(Last-first-middle initial)*
Nottingham, Wilfred A.

DATE OF BIRTH (Month-day-year)	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL
August 20, 1949		--	--	1

EDUCATION *(College, degree, year, specialization)*
Georgia Institute of Technology, B.S., 1971
Electrical Engineering

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

REGISTRATION *(Type, year, State)*
E.I.T. - 1974 - Georgia

E. NAME *(Last-first-middle initial)*

DATE OF BIRTH (Month-day-year)	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL

EDUCATION *(College, degree, year, specialization)*

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

REGISTRATION *(Type, year, State)*

F. NAME *(Last-first-middle initial)*

DATE OF BIRTH (Month-day-year)	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL

EDUCATION *(College, degree, year, specialization)*

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

REGISTRATION *(Type, year, State)*

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15. CONTINUED — PERSONAL HISTORY STATEMENT OF PRINCIPALS AND ASSOCIATES WITHIN YOUR FIRM
(Furnish complete data but keep to essentials)

. NAME *(Last-first-middle initial)*					J. NAME *(Last-first-middle initial)*				
ATE OF BIRTH *(Month-day-year)*	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL	DATE OF BIRTH *(Month-day-year)*	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL
DUCATION *(College, degree, year, specialization)*					EDUCATION *(College, degree, year, specialization)*				
EMBERSHIP IN PROFESSIONAL ORGANIZATIONS					MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS				
GISTRATION *(Type, year, State)*					REGISTRATION *(Type, year, State)*				
. NAME *(Last-first-middle initial)*					K. NAME *(Last-first-middle initial)*				
TE OF BIRTH *(Month-day-year)*	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL	DATE OF BIRTH *(Month-day-year)*	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL
UCATION *(College, degree, year, specialization)*					EDUCATION *(College, degree, year, specialization)*				
EMBERSHIP IN PROFESSIONAL ORGANIZATIONS					MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS				
EGISTRATION *(Type, year, State)*					REGISTRATION *(Type, year, State)*				
. NAME *(Last-first-middle initial)*					L. NAME *(Last-first-middle initial)*				
ATE OF BIRTH *(Month-day-year)*	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL	DATE OF BIRTH *(Month-day-year)*	YEARS OF EXPERIENCE	AS PRINCIPAL IN THIS FIRM	AS PRINCIPAL IN OTHER FIRMS	OTHER THAN PRINCIPAL
DUCATION *(College, degree, year, specialization)*					EDUCATION *(College, degree, year, specialization)*				
MBERSHIP IN PROFESSIONAL ORGANIZATIONS					MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS				
CISTRATION *(Type, year, State)*					REGISTRATION *(Type, year, State)*				

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16. PRESENT ACTIVITIES ON WHICH YOUR FIRM IS DESIGNATED ARCHITECT OR ENGINEER OF RECORD

NAME AND TYPE OF PROJECT	LOCATION	NAME AND ADDRESS OF OWNER	ESTIMATED CONSTRUCTION COST	PERCENT COMPLETED	
				DESIGN	FIELD SUPV.
Gas Distribution System.	Ga. College at Milledgeville	Regents of University of Ga. Atlanta	35,000	5	--
Revisions to Air Conditioning System	Warner Robins, Ga.	Peach Belt Nursing Home Warner Robins	50,000	5	--
Air Conditioning of Auditorium & Gymnasium	Abraham Baldwin College Tifton	Regents of University of Ga. Atlanta	185,550	100	0
Mechanical Modifications to Student Center	Albany State College Albany	Regents of University of Ga. Atlanta	35,000	85	--
Outside Lighting for Vocational School	Bibb Vo. Tech Macon	Bibb County Board of Education - Macon	35,000	100	0
Preventative Maintenance Program	Fort Valley State College - Ft. Valley	Regents of University of Ga. Atlanta	No Construction	95	N.A.
Mechanical Modifications to Classroom & Science Bldg.	Albany Junior College Albany	Regents of University of Ga. Atlanta	37,000	100	80
Air Conditions for Six Buildings	Methodist Childrens Home Macon	Methodist Church Macon	56,000	100	5
Air Conditioning for Smith Hall	Gordon Jr. College Barnesville	Regents of University of Ga. Atlanta	115,000	10	0

TOTAL NUMBER OF PRESENT PROJECTS: 9

TOTAL ESTIMATED CONSTRUCTION COST: $548,550

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17. PRESENT ACTIVITIES ON WHICH YOUR FIRM IS ASSOCIATED WITH OTHERS
(Indicate phase of work for which your firm is responsible)

NAME OF PROJECT AND PHASE OF WORK (M & E ON ALL)	LOCATION	OWNER	ESTIMATED CONSTRUCTION COST OF ENTIRE PROJECT	ESTIMATED CONSTRUCTION COST OF WORK FOR WHICH YOUR FIRM IS RESPONSIBLE	PERCENT OF ENTIRE PROJECT COMPLETED: DESIGN	PERCENT OF ENTIRE PROJECT COMPLETED: FIELD SUPV.	FIRM ASSOCIATED WITH
Student Center	ABAC	Regents of Ga.	1,300,000	300,000	100	70	Thomson, Sanders& Dupree
Classroom Bldg.	Ft. Valley	Regents of Ga.	680,000	300,000	100	25	Hall, Ferguson & Berg
Auditorium	Macon	Ga. Dept. Ed.	600,000	190,000	100	60	H. Corsini
Student Center	Valdosta	Valdosta State	500,000	200,000	100	10	Thomson, Sanders& Dupree
High School	Barnesville	Lamar County	1,800,000	600,000	100	90	Corsini
Houston Co. Hospital	Warner Robins	Houston County Hospital Auth.	1,700,000	675,000	100	90	H. Corsini
Lamar Co. School	Barnesville	Lamar County Bd. of Ed.	1,900,000	600,000	100	80	H. Corsini
Lambdin Hall	Gordon Jr. Coll. Barnesville	Regents of Ga.	500,000	127,000	99	--	Taylor & Collum, Arch. Atlanta
Macon Federal Bldg.	Macon	Macon Federal	2,900,000	1,024,450	100	50	Matthews, Holliday, Couch & Hollis
Internal Medicine Assoc.	Macon	Charter Medical	235,000	94,000	80	--	Matthews, Holliday, Couch & Hollis
Westbrook Hospital	Richmond, Va.	Charter Medical	2,500,000	989,800	100	50	Ditto
Mary Elizabeth Hosp.	Raleigh, N.C.	Charter Medical	4,800,000	1,600,000	5	--	Ditto
Crawford County Sch.	Lizella	Crawford County	1,800,000	600,000	5		Ditto
McGaw Laboratories	Milledgeville	McGaw Lab.	900,000	200,000	90		Twiggs Const. Co.
American Standard	Macon	American Stand.	2,000,000	350,000	95		Ditto
Marta Proj. 320	Atlanta	Metropolitan Atl.	2,500,000	620,000	2		Lowe Eng., Inc.
Macon Voc. Tech. Sch	Macon	Bibb County	3,100,000	850,000	100	10	Dunwody & Co.
Library	Gordon Jr. Coll.	Regents	1,500,000	500,000	2		Ditto
West Point Vis.Center	West Point	Corp of Engr.	398,000	85,000	98		Ellis, Ingram, Parris & Gregory
Ware Co.Jr. College	Waycross	Regents	1,800,000	750,000	100	0	Ditto
Rural Devel.Center	Tifton	Regents	1,000,000	375,000	100	5	Ditto
City Hall	Cordele	City of Cordele	995,000	348,000	100	2	Ditto
U.S. P.O. & FOB	Griffin	U.S. Govt.	1,145,000	400,000	100	70	Bilbro, Spangler & Manley

TOTAL NUMBER OF PRESENT PROJECTS: 23

TOTAL ESTIMATED CONSTRUCTION COST OF WORK FOR WHICH YOUR FIRM IS RESPONSIBLE: $11,778,250

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18. COMPLETED WORK ON WHICH YOUR FIRM WAS DESIGNATED ARCHITECT OR ENGINEER OF RECORD DURING THE LAST 10 YEARS

NAME AND TYPE OF PROJECT	LOCATION	YEAR YOUR WORK COMPLETED	NAME AND ADDRESS OF OWNER	ESTIMATED CONSTRUCTION COST	CONSTRUCTED (Yes or No)
Air Conditioning for Seven Existing Schools	Fort Valley	1965	Peach County Bd. of Ed.	320,000	Yes
Repair Htg. Eq.-Bldg. #125	RAFB	1966	USAF	100,000	Yes
Air Cond. for Bldg. #56	RAFB	1967	USAF	25,000	Yes
Textile Plant - Mech. & Elec	Forsyth	1968	W. Carter Co.	120,000	No
A. C. Feasibility Study	Macon	1968	Keebler Co.	100,000	No.
New School Heating Systems	Milledgeville	1966	Baldwin County Bd. of Ed.	31,000	Yes
Gymnasium Air Conditioning	Cochran	1970	Middle Georgia College	66,000	Yes
Central Plant - ABAC	Tifton, Ga.	1972	Regents of University of Ga.	450,000	Yes
Underground Chilled & Hot Water Dist. System - ABAC	Tifton, Ga.	1972	Regents of University of Ga.	210,000	Yes
A. C. & Electrical Service	Monticello	1970	Jasper County Hospital	75,000	Yes
A.C. & Electrical Service	Macon	1970	St. Josephs Catholic Church	60,000	Yes
Creswell Hall Air Cond.	Tifton	1971	Abraham Baldwin Ag. College	80,000	Yes
A. C. Renovations	Tifton	1969	Abraham Baldwin Ag. College	70,000	Yes
Project 71-C-0631	RAFB	1971	USAF	200,000	Part
Projects WR-36-3, 88-3, 154-2	RAFB	1972	USAF	167,000	No
Project WR-219-2	RAFB	1972	USAF	203,000	No.
A.C. OR & OB Laurens Memorial Hospital	Dublin, Ga.	1973	Laurens Hospital Auth.	81,779	Yes
A.C. Union Point Baptist Ch.	Union Point, Ga.	1973	Union Point Baptist Church	25,000	Yes
Electrical Rewiring Sandersville School	Sandersville, Ga.	1972	Sandersville Bd. of Ed.	55,000	Yes
Project WR-207-2	RAFB	1974	USAF	55,000	Yes
Electrical Distribution Sys.	Bainbridge Jr. College	1974	Regents of University of Ga.	155,000	Yes
Addn. to Central Plant	Abraham Baldwin College	1974	Regents of University of Ga.	76,000	Yes
Motor Control System	Gordon, Ga.	1974	Freeport Kaolin Co.	42,000	Yes
Mechanical Renovations	Gordon Jr. College	1974	Regents of University of Ga.	35,000	Yes
Electrical Rev. - Smith Hall	Gordon Jr. College	1974	Regents of University of Ga.	25,000	Yes
Lighting Revision B/640	RAFB	1971	U. S. Air Force	33,000	Yes

TOTAL NUMBER OF COMPLETED PROJECTS: 96

TOTAL ESTIMATED CONSTRUCTION COST: $4,625,000

19. COMPLETED WORK ON WHICH YOUR FIRM WAS ASSOCIATED WITH OTHER FIRMS DURING THE LAST 10 YEARS (PARTIAL)
(Indicate phase of work for which your firm was responsible)

NAME OF PROJECT AND PHASE OF WORK (M & E ON ALL)	LOCATION	OWNER	YEAR YOUR WORK COMPLETED	ESTIMATED CONSTRUCTION COST OF ENTIRE PROJECT	ESTIMATED CONSTRUCTION COST OF WORK FOR WHICH YOUR FIRM WAS RESPONSIBLE	CONSTRUCTED (Yes or No)	FIRM ASSOCIATED WITH
Macon Jr. College	Macon	Regents	1969	2,430,000	930,000	Yes	Matthews, Holliday Couch & Hollis
First National Bank	Macon	Bank	1972	2,050,000	768,000	Yes	Ditto
Science Bldg.	Macon	Mercer Univer.	1969	1,670,000	450,000	Yes	Hall, Ferguson & Berg
St. Paul Apts.	Macon	St. Paul Church	1973	2,100,000	797,000	Yes	Matthews, Holliday, Couch & Hollis
Middle Ga. Hosp.	Macon	Charter Med.	1970	1,250,000	500,000	Yes	Hall, Ferguson & Berg
Lanier High School	Macon	Bibb Bd. of Ed.	1969	975,000	300,000	Yes	Warren & Riley
Ballard Hudson Hi	Macon	Bibb Bd. of Ed.	1966	890,000	296,000	Yes	Bernard A. Webb
Willingham Jr. Hi	Macon	Bibb Bd. of Ed.	1966	916,000	174,000	Yes	Dunwody
Lynwood School	Fitzgerald	Ben Hill	1969	970,000	380,000	Yes	Bernard Webb
Fitzgerald Hi Sch	Fitzgerald	Ben Hill	1971	1,450,000	575,000	Yes	Dunwody
Perry Hospital	Perry	Houston County	1968	1,600,000	430,000	Yes	Corsini
Computer Center	Macon	Southern Bell	1968	850,000	300,000	Yes	Matthews, Holliday, Couch & Hollis
Library	Dalton	Regents	1972	810,000	250,000	Yes	Dunwody
Laboratory Bldg.	Macon	USDA	1973	1,300,000	530,000	Yes	Dunwody
Hospital	Atlanta	Charter Medical	1972	3,600,000	1,300,000	Yes	Matthews, Holliday, Couch & Hollis
Dormitory	Tifton	Regents	1973	950,000	375,000	Yes	Hall, Ferguson & Berg
Hospital Addn.1	Warner Robins	Houston County	1973	900,000	400,000	Yes	Corsini
Bank Addn.	Macon	Ga. Bank &Trust	1974	560,000	250,000	Yes	Hall, Ferguson & Berg
Branch Bank	Macon	Ga. Bank & Trust	1974	90,000	30,000	Yes	Ditto
Elementary Sch.	Milan	Telfair Co.	1974	250,000	100,000	Yes	A. S. Adams
Doctors Bldg.	Albany	Orthopedic Assoc	1974	100,000	40,000	Yes	Matthews, Holliday, Couch & Hollis
Tifton Fed. Sav.	Tifton	Tifton Federal	1974	225,000	100,000	Yes	Wm. Y. McLean
Dormitory	Douglas	Regents of Ga.	1974	1,100,000	400,000	Yes	Matthews, Holliday, Couch & Hollis
Dormitory	Tifton	Regents of Ga.	1973	740,000	175,000	Yes	William Y. McLean
High School	Ft. Valley	Peach Co. Bd.Ed.	1973	400,000	100,000	Yes	A. S. Adams
Infirmary	Macon	Mercer Un.	1974	350,000	125,000	Yes	Dennis & Dennis
Jr. College	Bainbridge	Regents of Ga.	1974	1,800,000	750,000	Yes	Ellis, Ingram, Parris & Gregory
Vocational School	Warner Robins	Houston Co.	1973	1,200,000	400,000	Yes	Corsini

TOTAL NUMBER OF COMPLETED PROJECTS: 800

TOTAL ESTIMATED CONSTRUCTION COST OF WORK FOR WHICH YOUR FIRM WAS RESPONSIBLE: $50,000,000

STANDARD FORM 251
JUNE 1961

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20. EXHIBITS OF COMPLETED WORK	*Unless specifically requested, submission of photographs is optional. Where submitted, furnish one exterior and one interior photograph of five examples of completed architectural work that are listed in items 18 and 19. (Photographs of models, renderings, sketches, etc., are NOT desired.) Size of photographs not to exceed 8¼"x11". On the back of each photograph give the following information: (1) Name of your firm; (2) Name and address of client; (3) Type of structure; (4) Location of structure; (5) Cost of specific structure. Photographs of electrical or mechanical facilities and other components of a decided engineering character are not necessary.*				
21. SECURITY CLEARANCE *(See Note d)*	A. CURRENT STATUS *(Check one)* ☐ ACTIVE ☐ INACTIVE ☒ NONE	B. DEGREE OF CLEARANCE	C. DATE OF CLEARANCE	D. CLEARED BY	E. HAVE PRINCIPALS BEEN CLEARED? ☐ YES ☐ NO

22. IN THE EVENT SPACES PROVIDED ON THE FORM ARE NOT SUFFICIENT FOR ENTRIES, OR IF YOU WISH TO FURNISH ADDITIONAL INFORMATION, IT MAY BE INSERTED HERE, ON THE REVERSE OF THIS PAGE, OR ON SEPARATE SHEETS, WITH APPROPRIATE REFERENCES.

23. PURPOSE OF SUBMITTING THIS QUESTIONNAIRE *(Check A or B, not both)*

☒ A. I/We wish to be considered for architectural or engineering services in connection with the ☒ design, ☒ inspection, ☐ supervision *(check applicable box or boxes)* of construction projects for Federal Agencies.

☒ B. This completed questionnaire is submitted as evidence of employment as outside associate or consultant. *(See item 12.)*

NAME OF FIRM ASSOCIATED WITH
Ellis, Ingram, Parris & Gregory
Bilbro, Spangler & Manley
Dunwody & Co.

As of this date: January 16, 1975 the foregoing is a true statement of facts.

NAME OF FIRM OR INDIVIDUAL SUBMITTING QUESTIONNAIRE	TYPE NAME AND TITLE OF PERSON SIGNING	SIGNATURE
NOTTINGHAM & BROOK	George M. Nottingham, Jr., Partner	

NOTES:
(a) Form is to be completed by typewriter. Completed forms may be reproduced in any quantity deemed necessary to meet distribution requirements.
(b) It will be to a firm's advantage to maintain its experience record on a current basis. This may be accomplished by periodically forwarding current data.
(c) It is NOT necessary for individuals or firms who check item 23B to furnish separate questionnaires for their outside associates and consultants.
(d) Item 21 is for consideration only with respect to classified projects.

STANDARD FORM 251
JUNE 1961

* GPO : 1968 O—293-012

29

53

54

William C. Sherbin, Senior Engineer, Special Energy Systems
Westinghouse Corporation

Education:

B.S. Mechanical Engineering, Bucknell University, 1971.
M.S. Mechanical Engineering, University of Maryland, 1973.
Ph.D. Program, University of Maryland, 1973 to Present
Graduate School Major: Energy Conversion
Minor: Dynamics

Experience:

1971 - Present	Westinghouse Electric Corporation Defense & Electronic Systems Center Baltimore, Maryland 21203
1974 - Present	Special Energy Systems. Analysis, design, and development of solar heating and cooling systems and subsystems for commercial and residential buildings. Development of mathematical models to predict solar system performance and building thermal loads.
1973 - 1974	Structural Dynamics and Analysis Group. Design and structural analysis of electronic packages in severe shock and vibration environments. Analysis and design of vibration isolation systems. Mechanical responsibility for the destructive test of an airborne electronic countermeasures pod.
1971 - 1972	Mechanical Design and Development Engineering. Analysis, design, and development of hydraulic servo actuators and electronic countermeasures systems. Design and test of power transmissions for surveillance radar. Development of an electro-optical inertially stabilized heliostat.
Memberships:	American Society of Mechanical Engineers International Solar Energy Society

4.0 PROPOSED DESIGN PHASE I BUDGET SUMMARY

For a Solar Heating and Cooling Experiment at the Warner Robins Public Library

	Currently Funded	ERDA Participation
Architecture Design (Includes Engineering Fees)	$ 22,200.00	$ 14,200.00
Solar Engineering Consultants	0	26,387.00
HVAC Supplemental Engineering	0	9,650.00
Structural Engineering	0	4,700.00
Total ERDA Cost for Phase I Design		$ 54,937.00

5.0 VALIDITY

Data collection and analysis for the experiment, conducted by Georgia Institute of Technology, will remain valid for 365 days.

JOHN C. STENNIS, MISS., CHAIRMAN
STUART SYMINGTON, MO.
HENRY M. JACKSON, WASH.
HOWARD W. CANNON, NEV.
THOMAS J. MC INTYRE, N.H.
HARRY F. BYRD, JR., VA.
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WILLIAM L. SCOTT, VA.
ROBERT TAFT, JR., OHIO
DEWEY F. BARTLETT, OKLA.
T. EDWARD BRASWELL, JR., CHIEF COUNSEL AND STAFF DIRECTOR

United States Senate
COMMITTEE ON ARMED SERVICES
WASHINGTON, D.C. 20510

July 16, 1975

Dr. Charles Chen
Program Manager
Division of Solar Energy
Energy Research and Development Administration
1800 G Street, N. W.
Washington, D. C. 20550

Dear Dr. Chen:

I have been advised by Mr. Warren Phillips, Director of the Houston County Public Libraries, that the Library System plans to submit their final proposal for an experimental heating and cooling system to be incorporated into a new public library building to be constructed in Warner Robins, Georgia, during the last week in July.

This experiment, as outlined in the preliminary proposal submitted June 16, 1975, will advance the state of the art in heating and cooling in medium sized publicly financed buildings. In addition, the Library System feels that a public library is the best publicly financed building for the experiment because of the number of hours a day the building is in use and the large number of people it serves.

I would like to urge your most serious consideration of this proposal, and would also like to request that you keep me informed on the decision reached by ERDA.

Sincerely,

Sam Nunn

cc: Mr. Warren Phillips
Houston County Public Library System
1201 Washington Avenue
Perry, Georgia 31069

JACK T. BRINKLEY
THIRD DISTRICT OF
GEORGIA
2412 RAYBURN HOUSE OFFICE BUILDING
PHONE: 225-3901

Counties:
CHATTAHOOCHEE
CRAWFORD
DOOLY
HARRIS
HOUSTON,
MACON
MARION
MERIWETHER
MONROE
MUSCOGEE
PEACH
SCHLEY
SUMTER
TALBOT
TAYLOR
TROUP
UPSON

Congress of the United States
House of Representatives
Washington, D.C. 20515

ARMED SERVICES
COMMITTEE

VETERANS' AFFAIRS
COMMITTEE

LARRY M. WHEELER
Administrative Assistant

BOB FORT
Legislative—Press Assistant

BOB SWEENEY
District Representative

July 24, 1975

Dr. Charles Chen
Program Manager
Energy Research and Development
Administration
Washington, D. C. 20545

Dear Dr. Chen:

I am writing to let you know of my personal interest in a heating and cooling experiment to be carried out as part of the construction of a new public library building for Warner Robins, Georgia. This proposal has recently been submitted to your agency and I believe that it is a most worthy project as it serves to demonstrate the feasibility of solar energy for heating and cooling in a medium-sized public library. It is my judgment that the experimental phase of the project outlined in Mr. Phillips' proposal to you is consistent with the objectives of your charge by the Congress. The incorporation of the experiment and the solar capability which will result therein will be of great benefit to not only the advancement to the state of the art of heating and cooling of new public buildings but also to the citizens of the community in which the new structure is to be located.

Thanking you for your careful consideration of this proposal, I am

Sincerely,

Jack Brinkley

JACK BRINKLEY
Member of Congress

lsw

Office of the Governor
Atlanta, Georgia 30334

George Busbee
GOVERNOR

Norman Underwood
EXECUTIVE SECRETARY

July 16, 1975

Dr. Charles S. Chen
Project Manager
Division of Solar Energy
Energy Research and Development
Administration
1800 "G" Street
Washington, D. C. 20545

Dear Dr. Chen:

The Energy Research and Development Administration has recently received from the Houston County Public Library System proposals for a heating and cooling experiment to be carried out as part of the construction of a new public library building for Warner Robins, Georgia.

I believe that this is a most worthy project because it serves to demonstrate the feasibility of integrating solar energy for heating and cooling for medium sized publicly financed buildings.

I strongly support the experimental work your agency is currently undertaking, and I urge your serious consideration of this project.

In my judgment, both the advancement of the state of the art and the general public will be served by this experiment being undertaken in a library facility.

Sincerely,

George Busbee

George Busbee

711 GRAND BUILDING MACON, GEORGIA 31201 AREA 912/744-6160

Middle Georgia APDC

Al Williams, Chairman

Charles H. Howell, Executive Director

July 29, 1975

Dr. Charles S. Chen
Project Manager
Division of Solar Energy
Energy Research and Development
Administration
1800 G Street
Washington, D.C. 20545

Dear Dr. Chen:

The Houston County Library Board has made application to your office for funding of architectural and engineering costs for a total solar heating and cooling system for the new Warner Robins Library facility. This project would serve as a valuable demonstration of solar energy in a unique public facility. Since libraries operate on a 12-hour schedule, seven days a week, the heating and cooling needs are different from the normal public building.

The Middle Georgia Area Planning and Development Commission is vitally concerned with energy use and energy conservation. This project would be beneficial in proving the desirability and feasibility of solar energy as an alternate energy source for a public facility. We support this project and urge your favorable consideration of this application.

Sincerely,

James C. Tonn
Assistant Executive Director

spg

JOHN C. STENNIS, MISS., CHAIRMAN
STUART SYMINGTON, MO.
HENRY M. JACKSON, WASH.
HOWARD W. CANNON, NEV.
THOMAS J. MC INTYRE, N.H.
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SAM NUNN, GA.
JOHN C. CULVER, IOWA
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STROM THURMOND, S.C.
JOHN TOWER, TEX.
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ROBERT TAFT, JR., OHIO
DEWEY F. BARTLETT, OKLA.
T. EDWARD BRASWELL, JR., CHIEF COUNSEL AND STAFF DIRECTOR

United States Senate
COMMITTEE ON ARMED SERVICES
WASHINGTON, D.C. 20510

March 31, 1975

Mr. Raymond Fields
Solar Energy Task Force
Energy Research and Development Administration
1800 G Street, N. W.
Washington, D. C. 20545

Dear Mr. Fields:

Mr. Warren H. Phillips, Director of the Houston County Public Libraries in Perry, Georgia, has recently sent you a proposal for a new library in Warner Robins, Georgia, which could serve as a model for a solar energy demonstration project.

I would appreciate your giving this project your most serious consideration, and would like to be kept informed as to the decision on this proposal.

Sincerely,

Sam Nunn

cc: Mr. Warren H. Phillips

HERMAN E. TALMADGE
GEORGIA
202 224-3643

COMMITTEES:
AGRICULTURE AND FORESTRY, CHAIRMAN
FINANCE
VETERANS AFFAIRS
AGRICULTURE APPROPRIATIONS
STANDARDS AND CONDUCT
NUTRITION AND HUMAN NEEDS
DEMOCRATIC POLICY

United States Senate
WASHINGTON, D.C. 20510

June 5, 1975

Mr. W.H. Phillips
Director
Houston County Public Schools
Perry, Georgia

Dear Mr. Phillips:

Pursuant to our previous correspondence, I am sending you a copy of a letter I have received on your behalf from ERDA.

This enclosed letter is in response to the representation I had made on your behalf and it is self explanatory. I hope that it helps clarify the situation for you, and if you have additional questions or comments, I hope you will get in touch with me again.

It has been a pleasure hearing from you, and I appreciate your giving me this opportunity to be of service to you. I hope that you will continue to give me the benefit of your thoughts and advice, and please feel free to call on me whenever I can serve you in any way.

With every good wish, I am

Sincerely,

Herman E. Talmadge

Enclosure

UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
WASHINGTON, D.C. 20545

MAY 30 1975

RECEIVED
JUN 2
SEN. TALMADGE

Honorable Herman E. Talmadge
Committee on Agriculture and Forestry
United States Senate

Dear Senator Talmadge:

This is to acknowledge and reply to your letter of March 27, 1975, on behalf of Mr. Warren J. Phillips, Director of Houston County Public Libraries in Warner Robins, Georgia.

Dr. Charles S. Chen of our staff has been in contact with Mr. Phillips to discuss his preliminary proposal for a solar heated and cooled library project. We are in the process of evaluating the merit of this proposal and will be contacting Mr. Phillips in the near future.

Thank you for your interest in the solar energy program of the Energy Research and Development Administration.

Sincerely,

for John M. Teem
Acting Director
Division of Solar Energy

HOUSTON COUNTY PUBLIC LIBRARIES

1201 WASHINGTON AVENUE PERRY, GEORGIA 31069 912-987-3050

Warren H. Phillips,
Director

July 22, 1975

Dr. Robert C. Seamans, Jr., Administrator
Energy Research and Development Administration
Washington, D. C. 20545

Dear Dr. Seamans:

The Houston County Public Library System has submitted a preliminary proposal to Dr. Charles Chen of your staff for a heating and cooling experiment to be carried out in conjunction with the construction of a new public library in Warner Robins, Georgia. With the encouragement of Dr. Chen we are submitting a final formal proposal the last week of July, incorporating an experiment utilizing an adjustable tilt solar collector panel system which is designed to maximize the available radiation of the sun seasonally and the use of a new generation of absorption chillers soon to be available from ARKLA.

We have retained the Special Energy Systems Division of Westinghouse Corporation as solar engineering consultants and are working with them on the experimental phase of the proposed project.

As a librarian I am particularly interested in the adaptation of solar energy to public libraries and feel that because public library buildings in this country are open longer hours and serve more people as well as more of a cross section of the general public than any other public institution that a public library can ideally serve to demonstrate perhaps better than any similar public building the widespread feasibility of utilizing solar energy for publicly financed medium-sized buildings. This view is borne out particularly well with respect to the statistics currently available on public library construction covering the years 1970 to 1974. In those years 695 new public library buildings were constructed with a total cost of $ 344,642,980.00. These figures do not include academic or university library construction, nor do they reflect additions to, remodeling of, or renovation for existing structures.

Speaking as an administrator who must necessarily be concerned with the financing of a public service institution, I am keenly

aware, as I know you are,of the effect the current energy crisis has had on all such institutions throughout the country who rely for their livelihood on public monies. The increase in fuel costs which have been passed on to institutions like my own, who are already underfinanced, make it of paramount importance that we find an alternative energy source to fossil fuels.

I hope that the Energy Research and Development Administration will see the potential for a highly visible demonstration project in selecting a public library facility as a vehicle through which this particular experimental project may be realized.

Funding for solar capability in this new library building will be, undoubtedly, the single most significant breakthrough for public libraries in this century and will make visible on the local level to both private commercial interests and to public service institutions the feasibility of utilizing solar energy as a power source.

Sincerely,

Warren H. Phillips
Director

WHP/al

cc: John M. Teem
Roy Scott
Charles S. Chen

APPENDIX

A. SITE LOCATION

A.1 Middle Georgia i

A.2 Houston County ii

A.3 Warner Robins. iii

B. ARCHITECTURAL PLANS

B.1 Site Plan. iv

B.2 Floor Plan v

B.3 Elevations vi

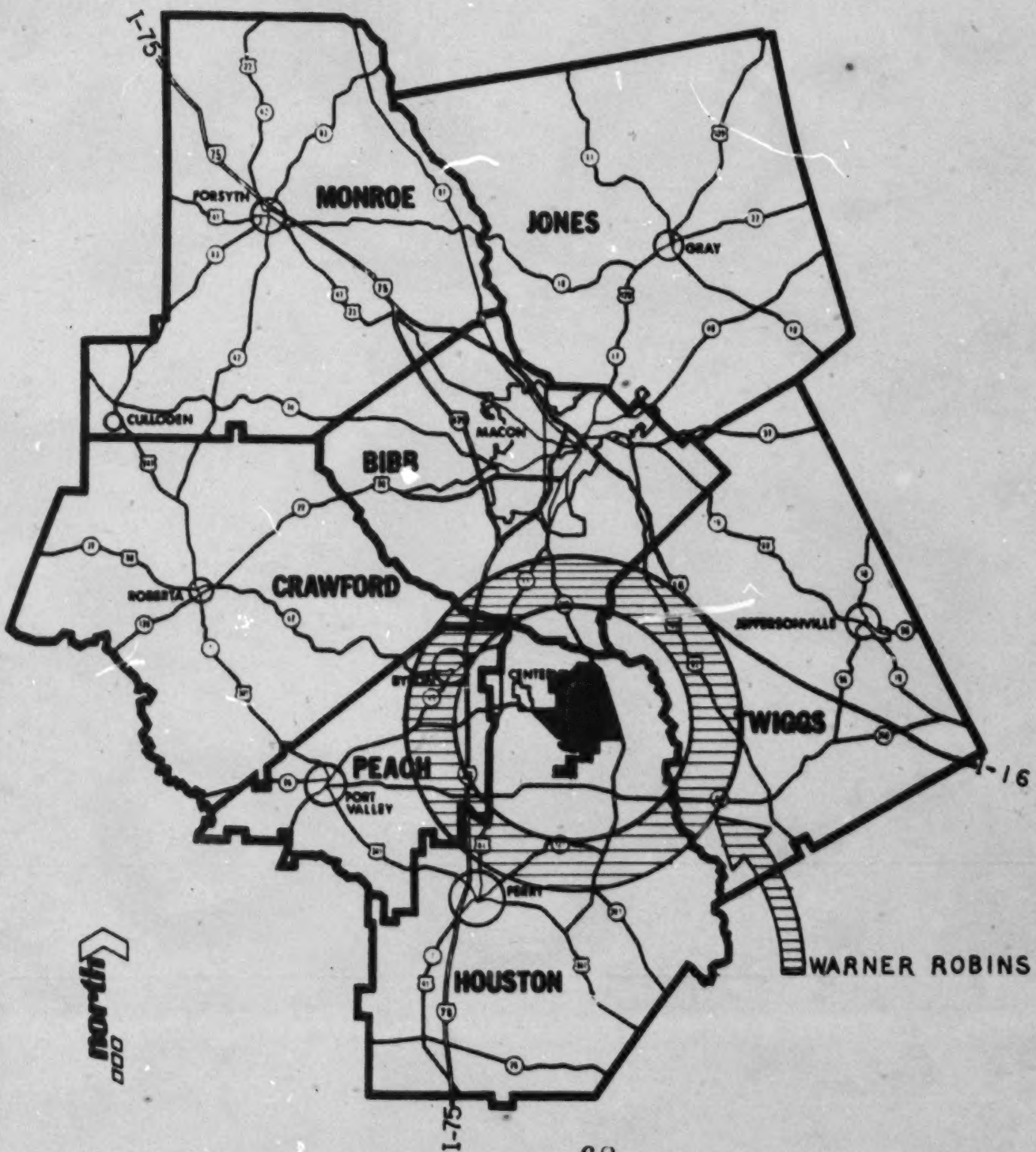
B.4 Photograph of Delineation. vii

C. DESCRIPTION OF TRNSYS. viii

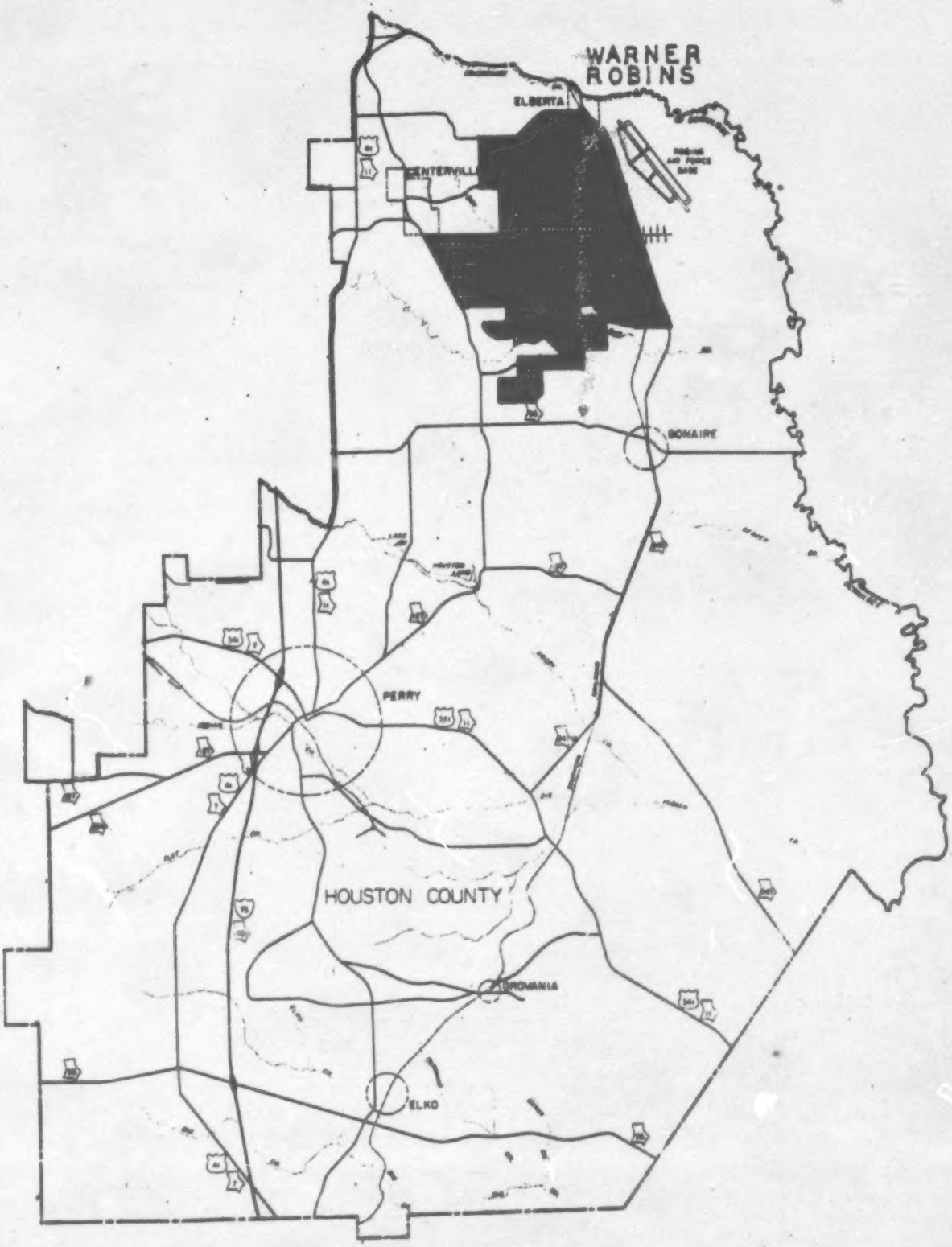
D. RELATED PROGRAMS ix

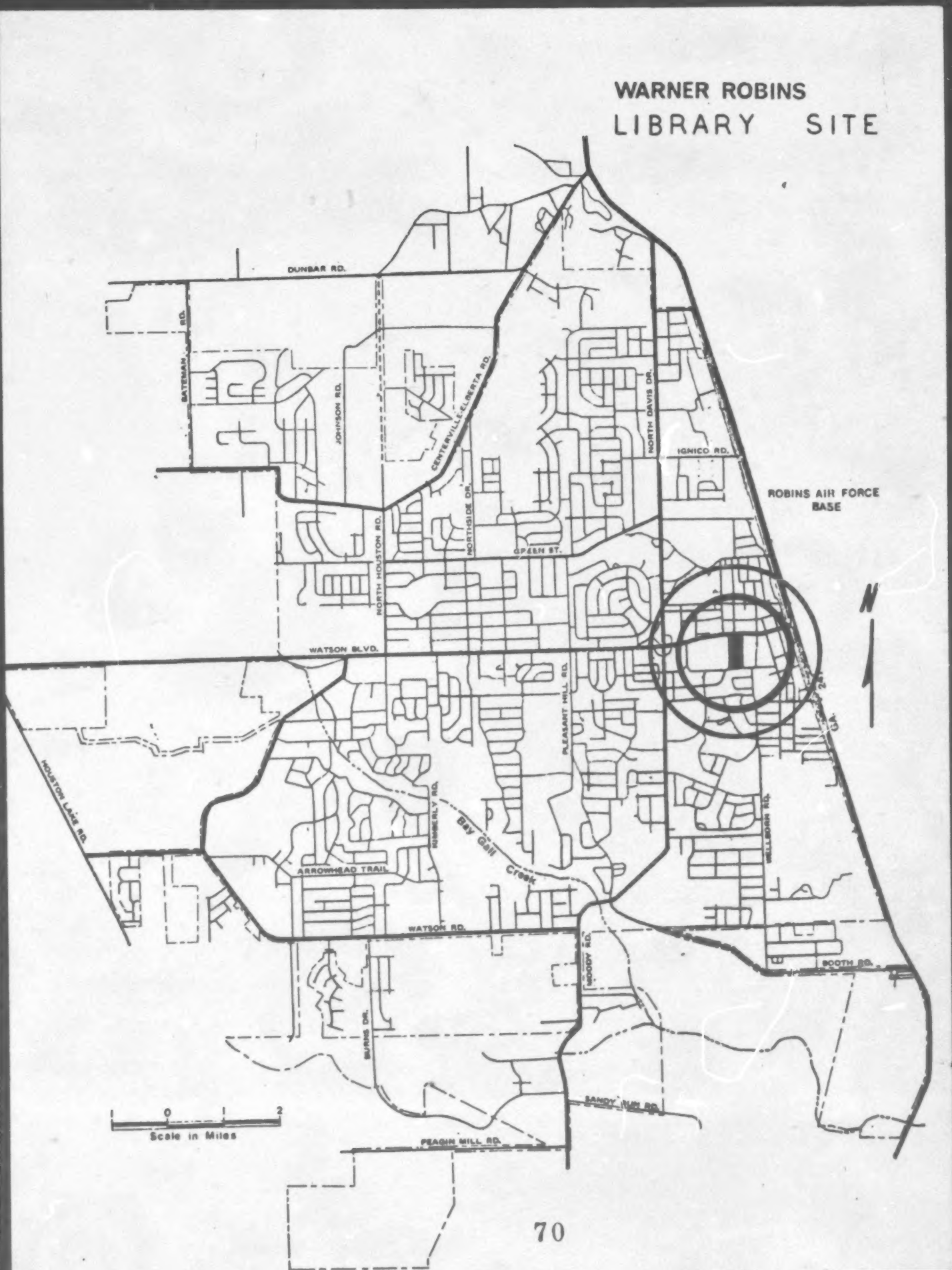
APPENDIX A

MIDDLE GEORGIA AREA

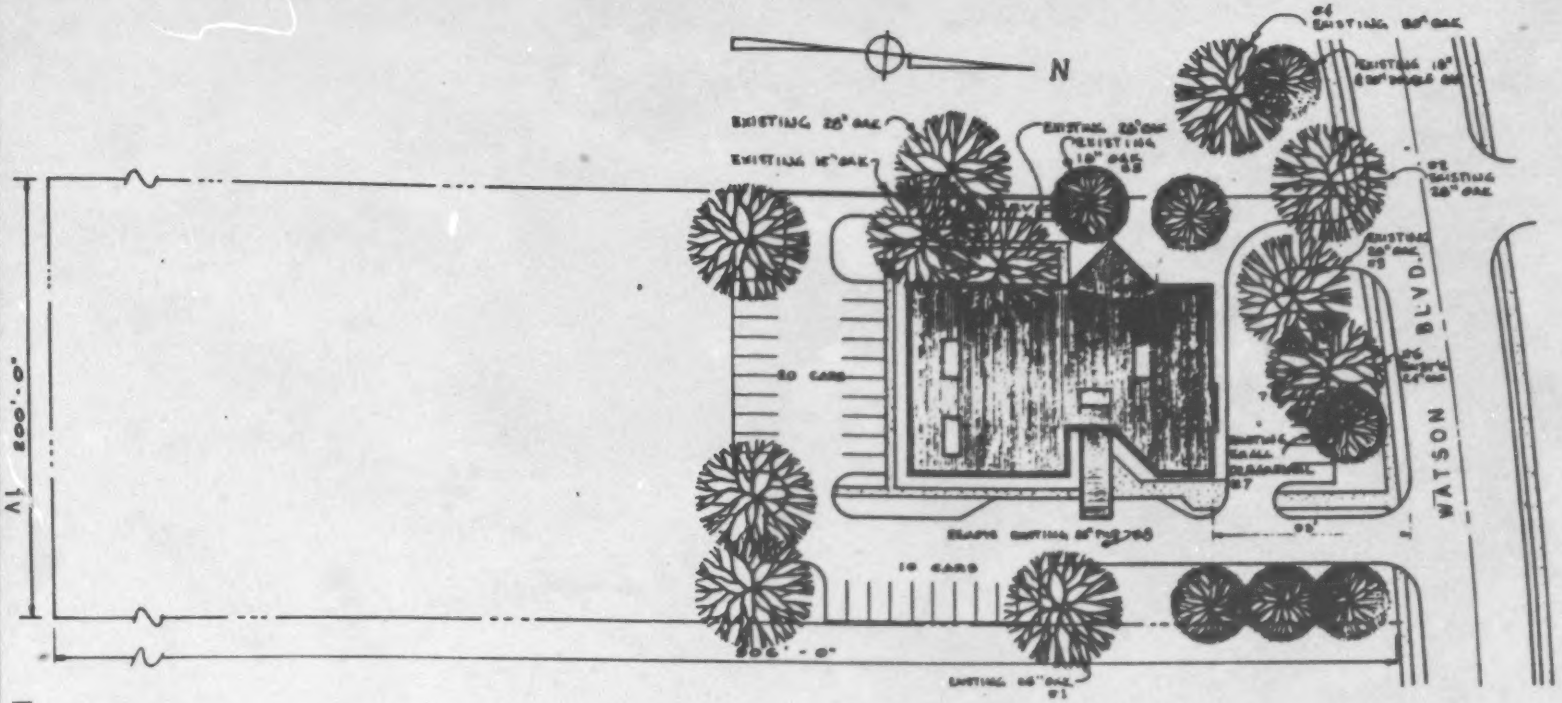


HOUSTON


WARNER ROBINS
ELBERTA
CENTERVILLE
BONAIRE
PERRY
HOUSTON COUNTY
ROMANIA
ELKO


WARNER ROBINS
LIBRARY SITE
DUNBAR RD.
BATEMAN RD.
JOHNSON RD.
NORTH HOUSTON RD.
CENTERVILLE-ELBERTA RD.
NORTHSIDE DR.
GREEN ST.
NORTH DAVIS DR.
IGNICO RD.
ROBINS AIR FORCE BASE
WATSON BLVD.
PLEASANT HILL RD.
HOUSTON LAKE RD.
RUSSELLY RD.
Bay Gall Creek
ARROWHEAD TRAIL
WATSON RD.
WILLIS RD.
BOOTH RD.
BURNS DR.
SANDY RUN RD.
PEACH MILL RD.
0
2
Scale in Miles
N

APPENDIX B



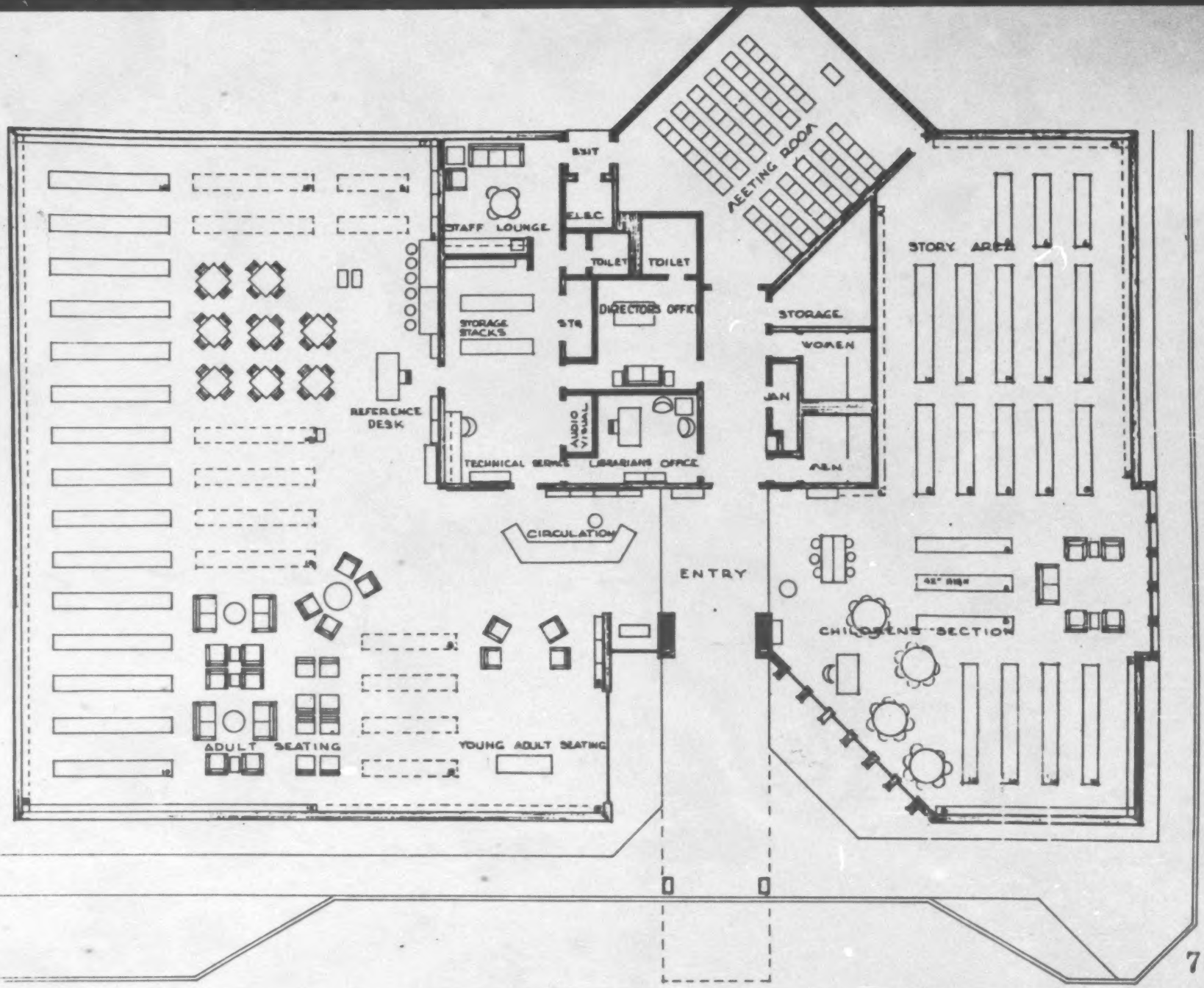
B.1 Site Plan

CITY HALL COMPLEX

A LIBRARY FOR WARNER ROBINS

oliver and associates, architects, a. i. a.

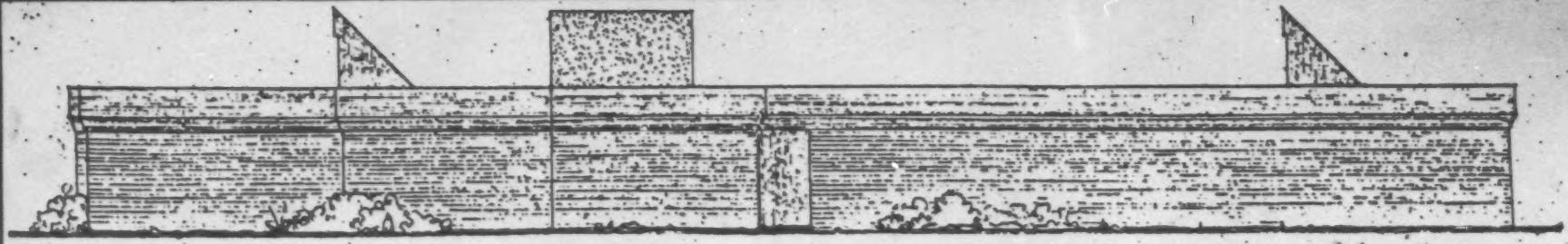
1215 GEORGIA POWER BUILDING MACON, GEORGIA



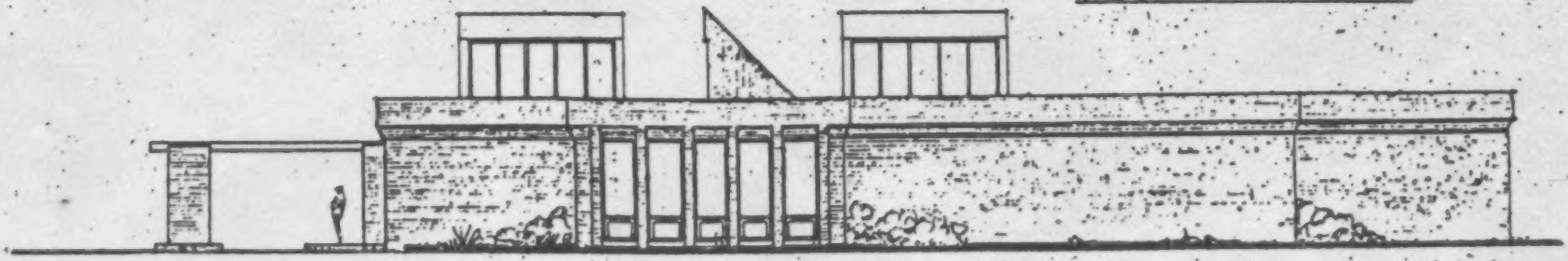
74

B.2 Floor Plan

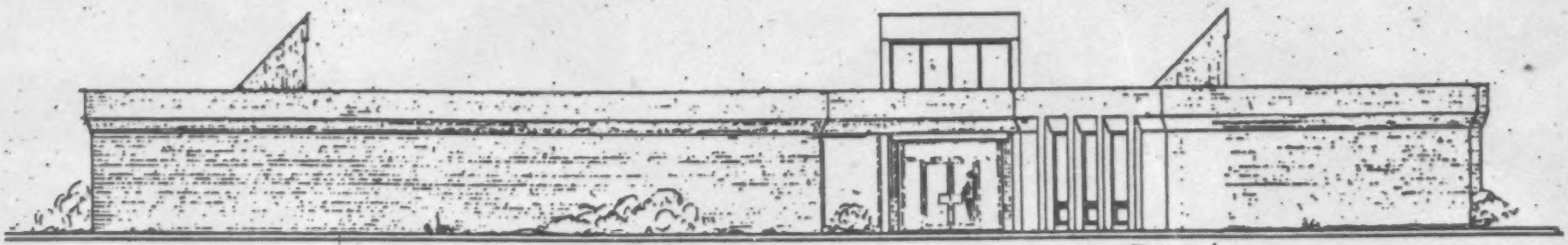
75



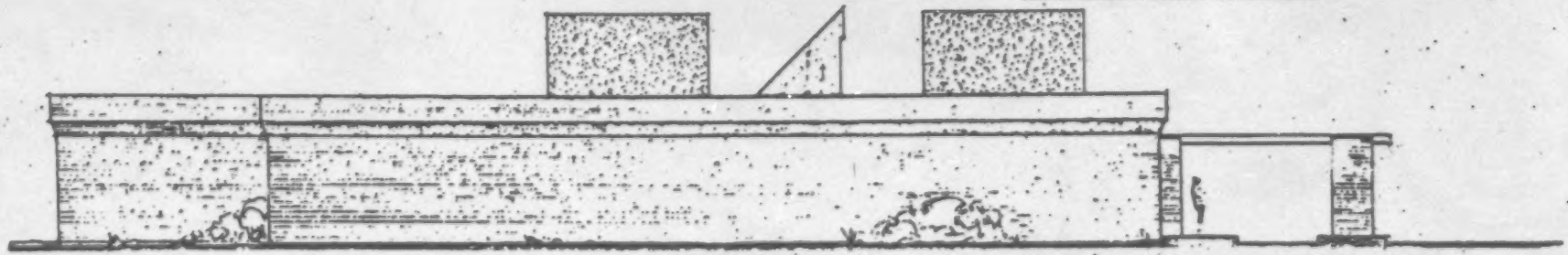
WEST ELEVATION



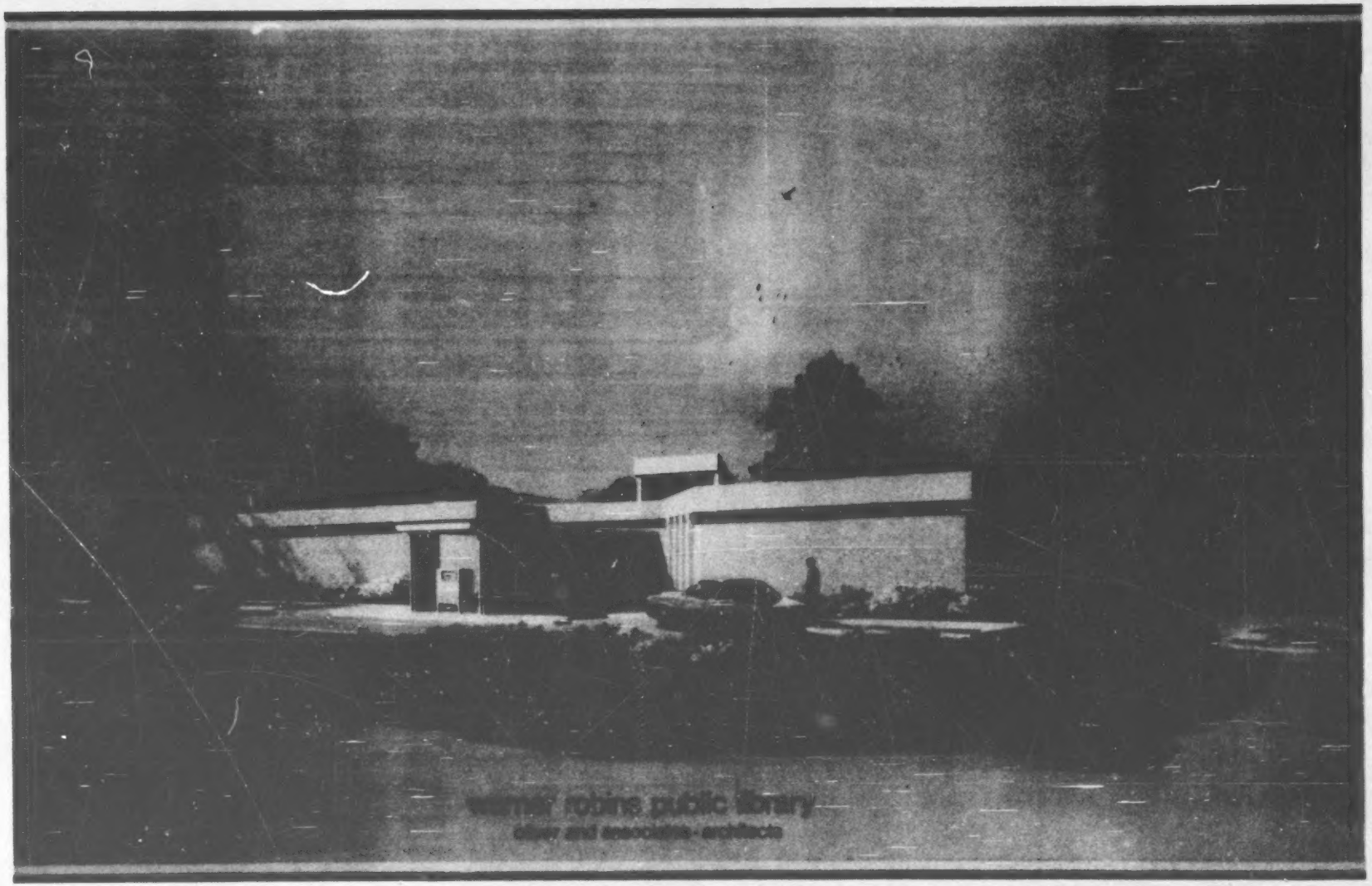
NORTH ELEVATION



EAST ELEVATION



SOUTH ELEVATION.


warner robins public library
oliver and associates-architects

APPENDIX C

This appendix contains descriptions of the following simulation programs:

* TRNSYS - solar system
* NBSLD - building load
* Hourly direct and diffuse radiation program

DESCRIPTION OF TRNSYS

TRNSYS is a digital computer program written in FORTRAN by the University of Wisconsin. The modular concepts of solar energy systems have been extended directly into the structuring of the program itself. TRNSYS is composed of an "executive" program and a number of subroutines, most of which model the function of a particular solar energy system component. General component subroutines have been written for most types of solar energy system hardware, including collectors, storage tanks, heat exchangers, heating loads, etc. In addition, certain other non-hardware modeling subroutines perform specific tasks necessary for the simulation, including card reading, numerical integration, printing, etc.

The user specifies which components he disires to include in a system and how they are to be connected. The modular nature of TRNSYS makes this process particularly convenient and simple. The inputs and outputs of component subroutines correspond to the inputs and outputs of the modeled hardware (e.g., temperature, flow rates, etc) and are simply connected, via the executive, to the outputs and inputs of other component subroutines.

COMPONENT MODELING

Solar energy system hardware components are modeled by individual subroutines. These comprise a library of equipment models available to the user for system simulation. The component subroutines may be classified as either single component models or combined component models.

The single component models include those subroutines which solve the basic mass and energy balance and rate equations describing

the operation of individual pieces of hardware. These subroutines may be fairly complex, requiring the solution of systems of algebraic and/or differential equations, as is the case for the multi-node storage tank, or they may be very simple, which is the case for a constant flow-rate pump model. For some hardware, analytical mathematical modeling is impractical as an analytic model may be very difficult to develop or expensive to use in a lenghty simulation. In addition, a user may want to simulate a system that includes a particular piece of hardware for which he has actual performance data. In these cases, the component model may be empirically defined by transfer functions obtained from curve fitting theoretical or actual performance characteristics. An example of such an empirical or "black box" model is the TRNSYS absorption air conditioner subroutine.

The combined component models were developed to facilitate the simulation of larger, more complex systems. Certain pieces of equipment are often found connected together in the same way from one system to another. To further simplify the user's task of specifying system configuration, single component models have been revised, where practical, into "combined" models. Combined models have been developed for collector-pump-controller, and load-pump controller auxiliary subsystems.

NBS LOAD DETERMINATION COMPUTER PROGRAM

The following is a listing of the variables that can be studied by this program:

a. Inside-out construction of exterior walls where the thermal insulation is placed on the outside of the building shell as opposed to conventional walls having insulation on the inside. (These two walls could have the same U-value and yet their thermal response would be quite different.)

b. Effect of interior partition walls or floor-ceiling sandwich structures on the heat storage characteristics of the room.

c. Off-peak heating or cooling of buildings to shave the peak heating or cooling demand.

d. Evaluation of intentionally undersized heating and cooling equipment by calculating the room temperature and humidity deviations from a design setpoint. (The results would indicate whether or not the indoor conditions would remain within acceptable limits.)

e. Evaluation of indoor thermal environment of various zones during the intermediate season, such as spring and autumn, when the heating or cooling requirements for these zones may not be in phase with that of the building as a whole. (This would apply to a case where a two-pipe system would be installed for example. The central system for the entire building might be switched to the heating in late autumn and yet some zones, particularly those facing south, may still require cooling. NBSLD can be used to determine the indoor thermal conditions of unheated or uncooled rooms.)

f. Use of solar energy for heating and cooling buildings as it relates to the thermal storage characteristics of the buildings.

g. Use of attic ventilation to reduce the cooling load since NBSLD can accurately predict attic temperatures.

h. Accurate determination of the need for heating and air conditioning in basement rooms.

i. Design of heating and cooling systems and equipment on the basis of intermittent operation, such as the shutdown of air conditioning facilities during the nighttime or weekends.

j. Effective use of natural air conditioning such as ventilation, shading, increased ceiling insulation and the subsequent determination of the requirements for mechanical cooling.

k. Effective planning of ventilation schedule to minimize a building heating load during the winter season.

l. Accurate evaluation of indoor comfort conditions based upon air temperature, humidity and mean-radiant temperatures.

m. Determination of the condition whereby moisture condensation takes place along interior surfaces of a building.

n. The effect of interior furnishings of various simple shapes upon the heating and cooling loads.

Figure E-1-6 depicts an overall calculation sequence to attain the hour by hour heating and cooling of buildings. Shown in the double lined boxes are input data to be supplied whereas those in single lined boxes indicate calculations to be performed. The cycle indicators show the iteration cycles for the number of buildings, the number of rooms in a given building and the number of days for which the calculations are performed.

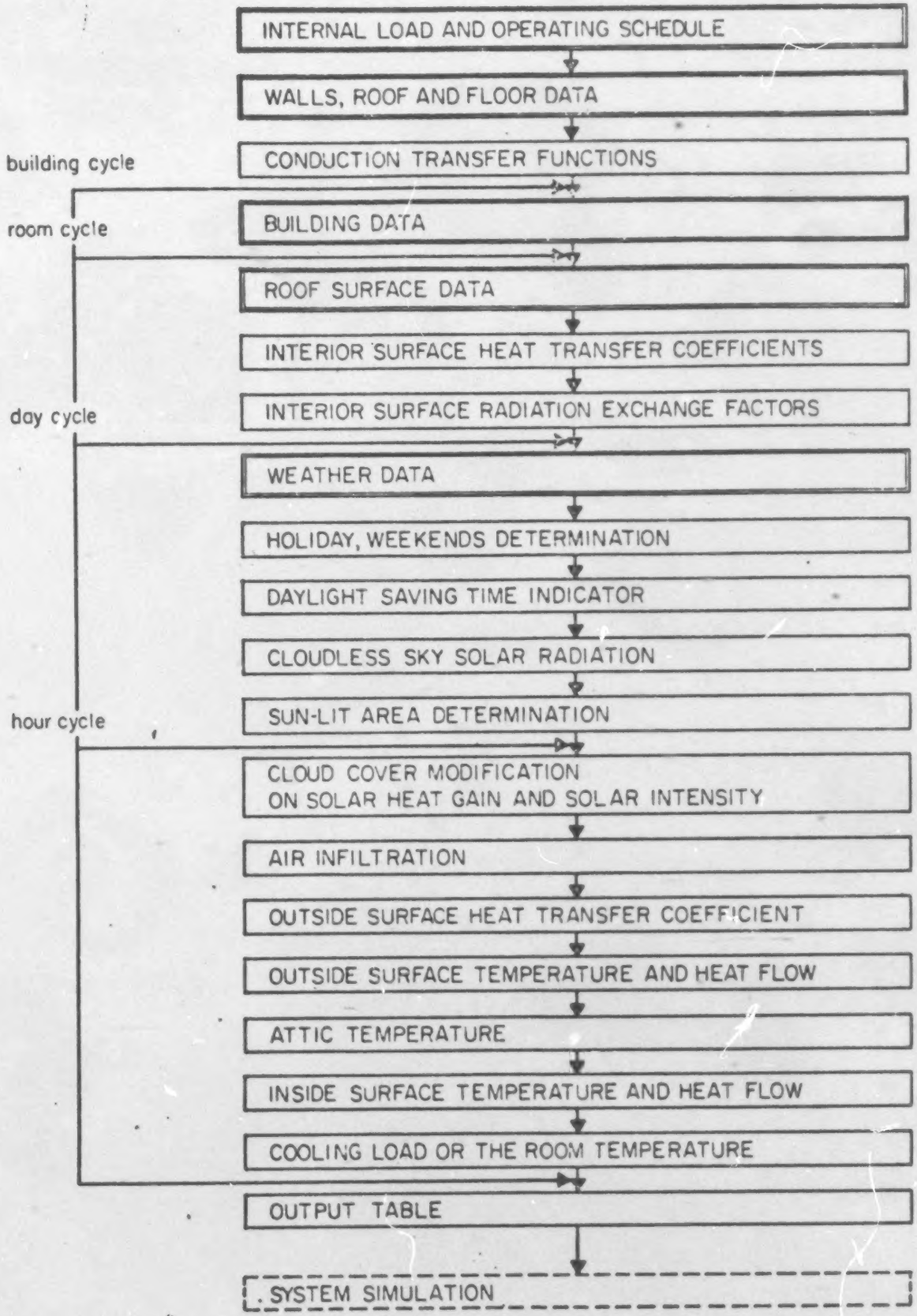


Figure E-1-6 NBSLD Flow Diagram

COMPUTING HOURLY VALUES OF DIFFUSE AND DIRECT SUNLIGHT

Sunlight in strongly attenuated by passage through the earth's atmosphere through absorption and scattering by aerosols and gaseous molecules. The interactions are wavelength-dependent and extremely complex, and result in variations in spectral composition, flux density, the relative proportions of direct beam and diffuse skylight radiation, and the hemispherical distribution of skylight. The amounts of scattering and absorption are dependent also upon the air mass penetrated and hence on solar elevation and atmospheric composition.

Solar system models may be operated with hypothetical or real solar data for input. Real data are necessary for specific comparisons with field performance, as is required in model validation. Unfortunately, daily or hourly measurements of direct and diffuse radiation have been made at only a few locations, and it is commonly necessary to work from daily total shortwave radiation (direct plus diffuse) as recorded by a pyranometer. Computation of the diffuse fraction from theory requires detailed knowledge at atmospheric composition, or an estimate of cloudiness deduced from radiation received (H) as compared with the extraterrestrial radiation (Ho).

The latter approach is used, starting with the analysis provided by Liu and Jordan, for several comprehensive sets of observations of the diffuse fraction (D/H) in relation to the cloudiness index. (H/Ho). The extraterrestrial daily total radiation can be computed as follows:

$$Ho = 24\ R\ I\ (\cos L \cos d \sin W_s + W_s \sin L \sin d)/ \pi$$

where R is the correction for the earth-sun distance, I is the solar constant (2 ly/min), L is the latitude, d is the solar declination, and W_s is the sunset hour angle. The sunset hour angle is determined

from:

$$\cos W_s = - \tan L \tan d$$

The product of the diffuse fraction and an observed daily total radiation gives the diffuse radiation for the day.

To obtain hourly increments of diffuse radiation, Liu and Jordan derived a theoretical relation for the ratio of hourly diffuse radiation to daily diffuse radiation (r_D) as a function of sunset hour angle:

$$r_D = (\pi/24)(\cos W - \cos W_s)/(\sin W_s - W_s \cos W_s)$$

where W is the individual hour angle. They verified the relation with date from Massachusetts and Finland. For hourly increments of total radiation they used experimental curves of Hottel and Whillier and extended them with data from Winnipeg, Canada, for the ratio of hourly total radiation to daily total radiation (r_T). Both r_D and r_T are expressed graphically as functions of hour from noon and sunset hour angle. The products of r_D and daily diffuse radiation and of r_T and daily total radiation give the corresponding hourly increments of diffuse and total radiation. The difference between the hourly increments of diffuse and of total radiation gives the hourly direct radiation. From the graphs of r_D and r_T prepared tables are entered using a linear interpolation routine, and hourly diffuse and direct components are computed for the day. The data upon which the relationships are based are considered to be from relatively unpolluted atmospheres.

APPENDIX D

RELATED PROGRAMS

The related experience of Westinghouse and its associates is listed by organization in the following paragraphs.

SPECIAL ENERGY SYSTEMS

As an energy company and manufacturer of highly complex and sophisticated systems, Westinghouse has amassed a vast reservoir of experience related to solar energy systems. Westinghouse Special Energy Systems is experienced in managing major solar energy projects, including the design, construction and analysis of solar systems. As a result, it is high on the learning curve concerning the solar heating and cooling of buildings. Selected related Westinghouse Special Energy Systems projects are described in the summaries which follow.

WESTINGHOUSE SPECIAL ENERGY SYSTEMS
NSF SOLAR HEATING AND COOLING OF BUILDINGS PROGRAM
PHASE 0

Contract Number: NSF-C854

Contracting Agency: National Science Foundation
1800 G Street, N. W.
Washington, D. C. 20550

Client Contact: Dr. Charles S. Chen
Public Technology Program Manager
(202) 632-4175

Project Begun: September 1973 Project Completed: November 1974

Project Cost: $ 523,998 Type Contract: CPFF

Relevance to Proposed Contract:

* Development of functional, performance and operational requirements of solar heating and cooling systems for all types of buildings, and suitable for those climatic/ demographic regions where the potential market and fuel saving is greatest.

* Development of solar system conceptual design using computer programs as a design tool.

* Assessment of the capture potential of solar systems in the HVAC market.

* Assessment of the social and environmental acceptability of solar systems.

* Preparation of preliminary life cycle cost studies of candidate systems.

* Recommendation of Special and Proof-of-Concept Experiments.

Description of Effort:

This eight-month effort was completed on time and within contract cost. Tasks included development of heating and cooling requirements by building type and usage, and by climatic/demographic regions of the U. S. From these subsets, conceptual solar heating and cooling systems designs were generated, utilizing state-of-the-art techniques and components, augmented as necessary by conventional auxiliary systems. Systems were subjected to initial and total life cycle cost analysis and optimized for building type and location in trade-offs against conventional electric and fossil fueled systems.

WESTINGHOUSE SPECIAL ENERGY SYSTEMS
SOLAR HEATING AND COOLING EXPERIMENT
FOR A SCHOOL IN ATLANTA, GEORGIA

Contract Number: NSF-C908

Contracting Agency: National Science Foundation
1800 G Street, N. W.
Washington, D. C. 20550

Client Contact: Eugene R. Doering
Public Technology Program
(202) 632-4175

Project Begun: May 22, 1974 Project Completed: Scheduled April 1,1976

Project Cost: $836,628 Type Contract: Cost Sharing

Relevance to Proposed Contract:

The Westinghouse Solar Heating and Cooling Experiment for a School in Atlanta, Georgia, under contract to NSF is a microcosm of Phases 1 and 2 of the NSF program. It encompasses almost all of the elements of both of these phases including:

* Identification, screening and selection of experiment candidates.

* Negotiation of mutually acceptable conditions for conducting experiments with the candidates.

* Preparation of experiment plan to include:

  -Design, Engineering and Instrumentation
  -Procurement and Fabrication
  -Installation and Checkout
  -Operation and Maintenance
  -Data Collection and Analysis
  -Utilization

* Preparation of preliminary experiment design, specifications and cost.

* Preparation of Detailed Design and Working Drawings.

* Conducting computer assisted design confirmation.

* Securing competitive bids from subcontractors.

* Preparing detailed cost.

* Securing NSF approval of final design and cost.

* Letting and managing subcontracts.

* Procurement and installation of solar system.

* Checkout and operator training.

* System operation and maintenance.

* System performance data collection and analysis.

* Implementation of utilizing plan.

Description of Effort:

This experiment consists of the design, construction, and operational analysis of a solar heating and cooling system for the George A. Towns Elementary School in Atlanta, Georgia. System characteristics are:

* 10,000 square feet of collector area (PPG collectors).

* 100-ton absorption air conditioner (ARKLA).

* 45,000 gallons of hot and cold fluid thermal storage.

This experimental system is designed to provide solar space heating and cooling, and domestic hot water for a 32,000 ft^2, one-story school. Commencement of solar system operation is scheduled for early Summer, 1975, followed by twelve months of date collection and system performance analysis. Participants are:

* Westinghouse Special Systems, Baltimore, Maryland (Prime).

* Burt, Hill and Associates, Butler, Pennsylvania.

* Georgia Insititute of Technology, Atlanta, Georgia.

* Dubin-Mindell-Bloome Associates, West Hartford, Connecticut.

* PPG Industries, Inc., Pittsburg, Pennsylvania.

* ARKLA Industries, Inc., Little Rock, Arkansas.

* Various building contractors, Atlanta, Georgia.